Syphilis As A Modern Problem

1915

by

Wm. Allen Pusey, M.D.

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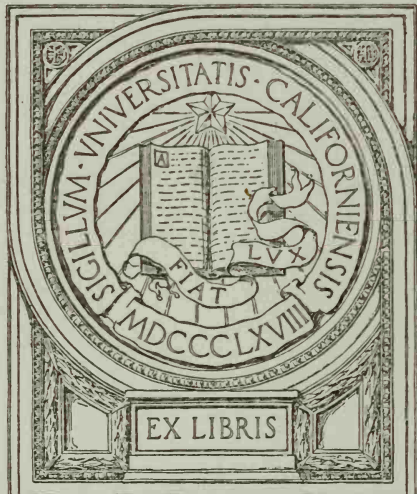

Albert Fabian Wolin
Memorial

SYPHILIS AS A MODERN PROBLEM

By

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CHICAGO
AMERICAN MEDICAL ASSOCIATION
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INTRODUCTION

In the following pages the subject of syphilis has been considered from the standpoint of the problems of the disease as they affect the individual and society; not that of the problems of the physician in his treatment of it. The topics which have been considered have an interest for the layman as well as for the physician.

The subject of syphilis should have an appeal to the intelligent layman far beyond its medical interest. The disease is one of the scourges of humanity; its control one of the most important of sanitary problems. Medicine has measures to offer in the direction of its sanitary control that do not involve the legal recognition of prostitution and that should not be morally objectionable. They are practical measures, which if given thorough and wide application, while they would not eradicate the disease, would vastly reduce its ravages. It seems incredible that society will not in time avail itself of this opportunity. When it does so, it will be through the influence of the enlightened public; the medical profession can only initiate the movement. It is to the intelligent public then that this treatment of the subject has been in great part directed.

The effort has been made to write, not a popular volume on the subject, but a substantial presentation. An occasional paragraph, I fear, will be found rather technical. The endeavor has been on the whole, however, to avoid technicalities, as far as possible in a concise statement of the subject, so that the layman can read the work without undue effort.

Chicago, April 20, 1915.

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CHAPTER I

THE BEGINNING OF SYPHILIS

"By the historical method alone can many problems in medicine be approached properly. For example, the student who dates his knowledge of tuberculosis from Koch may have a very correct, but a very incomplete, appreciation of the subject. Within a quarter of a century our libraries will have certain alcoves devoted to the historical consideration of the great diseases, which will give to the student that mental perspective which is so valuable an equipment in life."—*Osler.*

Syphilis has perhaps a wider variety of interests than any other disease. It is strictly a disease of man; and it is one of the most important diseases that afflict him. It has the tragic human interest of being hereditary—hereditary as no other important disease is; a disease that may pass as such from parent to child. Its manifestations are so varied that, in the words of Jonathan Hutchinson, "It is an epitome of pathology," and its study is one of the interests of every branch of medicine. It is surely the most difficult of diseases from the point of view of sociology, for it is inextricably involved in the great unsolved problem of modern civilization—the problem of the relation of the sexes. And, with all this, the history of syphilis is unique among the records of great diseases. For, unlike most diseases, it does not gradually emerge into the historical records of medicine as its characters become recognized, but appears on the stage of history with a dramatic suddenness in keeping with the tragic reputation it has made—as a great plague sweeping within a few years over the known world. Syphilis is the one disease whose history begins with a definite date. That date is the date of the discovery of America. It happens also that the ten years from 1903 to 1913 were fruitful of discoveries of such fundamental importance in syphilis that they represent an epoch—the most important epoch—in the history of our knowledge of the disease.

THE THREE VENEREAL DISEASES

There are three diseases that the world has agreed in calling venereal, although the cruelty of this epithet is constantly brought home to us by the fact that each of them originates with greater or less frequency from non-venereal sources. These diseases, enumerated in the order of their importance, are syphilis, gonorrhea and chancroid. It is impossible to say with absolute scientific accuracy that any infectious disease is always local, but, in the ordinary usage of the term, chancroid and gonorrhea are local venereal diseases. Syphilis, in contradistinction to the other two, is the venereal disease whose characteristic course is that of a systemic infection.

LACK OF KNOWLEDGE OF SYPHILIS AMONG THE ANCIENTS

Local genital diseases have been recognized from ancient times; references to them are numerous in both Occidental and Oriental literature. It is, however, a very striking fact that in all medieval and ancient literature, although sexual matters are favorite topics and are considered frequently and with freedom, there is no reference to a disease of the genitals which is followed by constitutional symptoms. Many diseases involving the skin are easily recognized in the descriptions of medieval and classical literature, but in spite of the most painstaking and zealous searching of all literary evidence, no single authentic document has been found in ancient literature in which a description of syphilis can be recognized. Prior to the last years of the fifteenth century no description of the syphilitic syndrome existed.

FIFTEENTH CENTURY THE EPIDEMIC OF SYPHILIS AT THE END OF THE

In the autumn of 1494, Charles VIII of France, with an army composed of mercenaries from all parts of western Europe, invaded Italy for the conquest of Naples. Italy, which at this time had reached the height of effeminate luxury and was weakened by the rivalries of her numerous states, was able to make no effective resistance to the well-organized forces of Charles; and the progress of his army through the peninsula was more of a triumphal march of debauchery than a serious military campaign. Charles was able to make good his claims to the throne of Naples and to set up his court for per-

manent occupation. In a short time, however, his army became so weakened through disease and dissipation that the Neapolitans were able to assert themselves and drive it out. The retreat of Charles and his soldiers from Italy in the summer of 1495 was little better than a rout, and the various troops were left ultimately to return to their countries in their own disorganized way.

THE BEGINNING OF THE EPIDEMIC

All contemporaneous records are at one in attributing the epidemic of syphilis which began in Italy at this time to Charles' army, and the quick spread of the disease over Europe to the scattering of his troops. Syphilis, if it existed before this time, was unrecognized. It was at the appearance of this great epidemic that physicians and laymen alike became aware of a disease of the genitals, which was followed by constitutional symptoms and of which they had no previous experience.

THE SPREAD OF SYPHILIS OVER EUROPE

The development of syphilis in Italy can be traced in the local chronicles of the time step by step with the progress of Charles' army, and with the scattering of his soldiers it went over western Europe in a rapid-spreading epidemic. It appeared in France and Germany and Switzerland in 1495, in Holland and Greece in 1496. It spread to England and Scotland in 1497; to Hungary and Russia in 1499.

Iwan Bloch, to whom all students are indebted for bringing together the known facts concerning the early history of syphilis, gives many contemporaneous references testifying to the interest excited by the new disease and to the importance attached to it. Thus, in 1496, the Parliament of Paris decreed that all persons infected with the disease should leave the city within twenty-four hours. In 1496-1497 prophylactic measures against the disease were attempted at Nürnberg. On April 21, 1497, the town council of Aberdeen, Scotland, ordered that, for protection from the disease which had come out of France and strange parts, all light women desist from their vice and sin of venery and work for their support, on pain, else, of being branded with a hot iron on their cheek and banished

from the town. Six months after the Aberdeen order, the Scottish Privy Council passed an edict ordering all inhabitants of Edinburgh afflicted with syphilis into banishment to the island of Inchkeith near Leith. In 1496, Grünpeck, a German writer, mentions that English soldiers in Italy had acquired syphilis. The archives of Bristol indicate that the disease was introduced there in 1498 from Bordeaux, and hence was called the Bordeaux disease. In the Breviarie of Health, by Andrew Boorde, published in 1575, it is stated that "In English Morbus Gallicus is called the French pocks, and when that I was young they were named the Spanish pocks."

Indeed this tendency to shift the responsibility for the disease on others by giving it their name, appears all through the early references to it. The Italians called it the Spanish or the French disease; the French called it the Italian disease; the English called it the French disease; the Russians called it the Polish disease; the Turks called it the French disease; the Indians and the Japanese called it the Portuguese disease. And, as we shall see, the first Spaniards who recognized the disease called it the disease of Española, which meant at that time the disease of Haiti.

ITS SPREAD TO THE ORIENT

In quick sequence the disease spread over the rest of the known world, carried by the great voyagers of that period. The Portuguese soon carried it to Africa and the Orient. The researches of Okamura and Susuki for Japan and China, and those of Jolly and others for India, show the introduction of syphilis into these countries only after contact with Europe. The Indian, Chinese and Japanese languages had no native names for the disease, and, like the Europeans, the Orientals gave it names indicating its foreign origin. In India the disease was first recognized in 1498, after the arrival of Vasco de Gama, who had left Portugal in 1497. It appeared in Canton, China, in 1505, after the visit of Europeans. It was not recognized in Japan until 1569, when its appearance at Nagasaki was attributed to Chinese or Portuguese sailors.

There is thus an accurate historic record of the startling spread of syphilis over the known world in a few years after 1495; and from

that time it has everywhere been endemic. No similar record exists of the sudden establishment of any other great disease among the larger part of the earth's inhabitants.

THE SEVERITY OF THE FIRST EPIDEMIC

The early recognition of syphilis and the prompt record of its spread over the civilized world are to be accounted for not so much by its newness, although it was everywhere recognized as a new disease, as by its severity. It amounts almost to an axiom in pathology that when an infectious disease first appears among a people—finds lodgment in a virgin soil—it rages with unwonted severity. This has been noted many times—with measles, scarlet fever, smallpox, and with syphilis in modern epidemics among isolated peoples. And this was a characteristic of the great epidemic of syphilis at the end of the fifteenth century.

In syphilis as ordinarily seen, its early manifestations are trivial in character, so trivial in fact that they are dangerously deceptive to the careless. The symptoms are mild and the patients are not acutely ill. All evidence, however, points to the severe character of the disease during this first epidemic. The cases ran an acute febrile course accompanied by symptoms of such severity as are now seen only in very unusual cases. There were high fever, intense headache and bone and joint pains; early skin symptoms so severe that they simulated smallpox; great prostration, and very frequently a fatal ending early in the disease, a result that is the rarest occurrence at present. This epidemic had all the characteristics of a virulent plague. With the loose morals of the time, however, syphilization of the world was rapid, and contemporaneous evidence, Fracastoro for example, indicates that the severity of the symptoms of early syphilis rapidly diminished; and within fifty years the disease had assumed the character with which the world has since been familiar.

EARLY SPECULATION AS TO ITS ORIGIN

The origin of syphilis was, at the time of this great epidemic and until recently has still been, a subject of much speculation and discussion. In keeping with man's superstitions, particularly at the time

of the appearance of syphilis, it has been attributed to every imaginable source; to vice and sin, and the anger of Providence; to dirt and beasts; to the elements and the influence of the heavenly bodies. Much unsuccessful effort was made to demonstrate its presence in Europe in the middle ages and earlier, although contemporaneous opinion pointed to the Spaniards and Americans for its origin. Later, as the disease became familiar and men lost sight of its sudden appearance, opinion veered round to the view that it had always existed in Europe. It is only within the last thirty years that its American origin has been practically demonstrated.

THE EVIDENCE OF ITS AMERICAN ORIGIN

The bald fact of the sudden appearance of syphilis shortly after the return of Columbus from his first voyage might easily suggest and lend plausibility to the theory of the American origin of the disease. The presence of Spanish adventurers in Charles' army would furnish the connecting link between Barcelona and Seville and Columbus' crew and the Italian epidemic. But in addition to the chronologic sequence of Columbus' return from America and the first recognized epidemic of syphilis in Europe, there are numerous other facts which confirm the American theory of its origin.

As we have seen, certain of these facts stand out prominently in the great epidemic:

The disease at the time was recognized as a new disease.

Names for it did not exist, and as it spread over Europe, men were hard put to give it a designation. The same was true on its appearance in the Orient.

The development of the great epidemic was definitely associated with the Italian campaign of Charles VIII, and its rapid spread over Europe was associated with the breaking up of his army. Its origin was recognized as being southwestern Europe. Even with the first outbreak in Italy, Spain was pointed to as the country whence it came, and the Spanish soldiers of Charles' army were incriminated as the authors of its distribution.

The disease pursued a course of unusual severity and spread over Europe with the rapidity of an infectious disease among people unprotected by any previous infection with it.

ABSENCE OF EVIDENCE IN EARLY EUROPEAN BONES

Parallel with the absence of any pre-Columbian documentary evidence of the existence of syphilis, is the absence of any evidence of syphilis in pre-Columbian European or Oriental bones. Bones withstand time, and the ravages of many diseases can be clearly traced in ancient bones that have come down to us. Syphilis is one of the diseases which leaves frequent, unmistakable evidence of its existence in bones; and if syphilis existed in Europe before the discovery of America it would be expected that evidence of it would be abundantly found in the great collections of prehistoric, ancient and medieval bones that exist. With the licentiousness of Rome and of the Dark Ages, syphilis would have been expected to leave a broad trail in the bony remains of those times; and yet careful scrutiny of those bones has failed to reveal any evidence of it. Most of the great European collections of human skeletons of pre-Columbian times have been carefully examined with this point in view, without the finding of a single syphilitic bone, and no less an authority than Virchow, one of the world's great anthropologists and probably its greatest pathologist, has declared that no pre-Columbian bone has been produced presenting evidence of syphilis. On the other hand, human skeletons of later date showing syphilitic changes have been found in all parts of the world.

AMERICAN PREHISTORIC BONES

On the other side it must be said that we have no unquestionable evidence of syphilis in pre-Columbian bones in America. Syphilitic bones have been found in North and South and Central America, and the presumption is strong that some of these bones are of pre-Columbian origin. Nevertheless, the difficulty in establishing the antiquity of Indian remains is so great that the pre-Columbian origin of these bones cannot be demonstrated.

SPANISH DOCUMENTARY EVIDENCE

But quite apart from this circumstantial evidence of the American origin of syphilis, there has been discovered in recent times definite documentary evidence indicating the introduction of syphilis into Spain

by the sailors of Columbus' first voyage. For the unearthing of this evidence we are indebted to Montejo y Robledo, a Spanish army surgeon, who critically examined all the early Spanish sources and reported his findings at the fourth Congreso internacional de Americanistas, at Madrid in 1882. The importance of Montejo's work was overlooked until attention was called to it by Seler in 1895.

Ruy Dias de Isla.—The most important evidence produced by Montejo—and surprisingly definite evidence it is—is the account of syphilis of Ruy Dias de Isla. To paraphrase Bloch: at the time of the first appearance of syphilis in Europe, Dias de Isla was a physician of note, who for ten years held the position of surgeon at the Hospital of All Saints in Lisbon. There he had a large experience in syphilis, which he incorporated in a special work which was published between 1510 and 1520, and was fortunately discovered by Montejo in the National Library of Madrid. Dias de Isla is known to have been in practice in 1493 in Barcelona, and he was thus in a position to be a witness to the very landing of syphilis in Europe. The title of Dias' book put into English is: "Treatise, entitled, Fruit of All Saints against the Disease of the Island Española, by Master Rodrigo de Isla, Surgeon and Citizen of Lisbon, to the Common and General Good of those Suffering from the Disease in Question, Commonly Called Bubas." The contents of the book are, briefly, as follows: Syphilis was unknown before the year 1493. It was brought by the crew of Columbus on his first voyage from Española, or Haiti. Dias called it the disease of the Island of Española, but also gave a number of native names for the disease. A majority of Columbus' crew returned to Spain infected with syphilis, and Dias himself treated several syphilitic sailors from this squadron, among them the pilot, Pinzon of Palos.

Oviedo, Las Casas, and the Spanish Chroniclers.—This record of Dias de Isla is corroborated by other contemporary Spanish chroniclers; particularly by the important works of Oviedo, and of the great Las Casas, both of whom were in America within a few years after its discovery. Oviedo was in Barcelona at the return of Columbus in 1493, and knew Columbus and members of his crew. In his "Historia general y natural de las Indias," and in a report drawn up

at the command of Charles V of Spain, he recites: That the disease was contracted from Indian women by the Spaniards with Columbus, that it was brought by them to Spain and thus transmitted to the army of Charles VIII by Spanish soldiers; and that syphilis should be called the West Indian disease, rather than the French or Neapolitan disease. He also mentions in independent corroboration of Diaz de Isla, that one of the brothers, Pinzon, contracted the disease, and that it "is common among the Indians, but in those regions is not so dangerous as with us."

Oviedo was an advocate for Spain, and it has been urged that the theory of the Indian origin of syphilis may have been readily adopted by him in his attempts to palliate the cruelty of the Spaniards toward the Indians. No such charge, however, will stand against Las Casas, whose efforts were all in behalf of the Indians, but who, nevertheless, did not hesitate to give in detail the facts of syphilis among them.

The father of Las Casas accompanied Columbus on his second voyage, and Las Casas himself was in Haiti in 1498, where he lived many years and wrote his "Historia general de las Indias." He records: "There were, and still are, two things which at the beginning were very dangerous to the Spaniards. One is the disease syphilis, which in Italy is known as the French evil. . . ."

"It is, however, known for certain that it came from this island, either when, with the return of the Admiral Don Christobal Colon with the news of the discovery of the West Indies, the first Indians arrived, whom I saw myself in Seville, or it may be that certain Spaniards were already tainted with this disease at the time of their first return to Castile. . . ."

"I took the trouble on several occasions to interrogate the Indians of this island as to whether this disease was of great antiquity, and they answered, 'Yes.'" . . .

"It is also an undoubted fact that all Spaniards addicted to sexual excess, who did not in this island observe the virtue of continence, were attacked by the disease, not one in a hundred escaping, unless the woman was healthy." He too emphasizes the greater severity of the disease among the Spaniards than among the natives.

In addition to Oviedo and Las Casas, numerous other of the early chroniclers of Spanish America (Pane, Sahagun, Hernandez), testify

as shown by the researches of Montejo, to the pre-Columbian existence of syphilis in America. They show not only that the disease was known to the Indians, but that the Indians had numerous names for it; that they were fairly familiar with its symptoms and course, and had well-worked-out methods of treatment for it, and that the disease was much milder in its course among the Indians than among the Spaniards, who contracted it from them.

This brief summary of the discoveries of Montejo y Robledo from his researches among original Spanish authorities, furnishes the final link connecting the origin of syphilis with America, and, it would seem, compels us to conclude that syphilis was introduced into Europe from Haiti by the sailors of Columbus on their return from his first voyage in 1493.

CHAPTER II

THE HISTORY OF SYPHILIS TO THE END OF THE NINETEENTH CENTURY

THE EARLY LITERATURE OF SYPHILIS

The interest excited by the epidemic of syphilis caused it to become at once the topic for many writers, and the abundant literature which grew up around the new disease is strong evidence of the importance which was given it. Indeed, one of the items which can be placed to the credit of syphilis is the great influence it exerted in arousing medicine from its medieval servitude to classical authority. Medicine, at this time, like other branches of learning, was hardly beginning to emerge from the darkness of the Middle Ages. It was controlled by speculation and superstition, and was dominated by Galen, chiefly as his dogmatism had filtered through from the Arabic school of medicine. It had not gone far enough to resurrect Hippocrates and to learn from him the importance of the study of the natural history of disease. But here was thrust on the world a disease concerning which Galen and Avicenna said nothing; a disease of vast importance on which physicians had no data in classical authority for philosophizing. Observation was therefore forced upon them; and so abundant was the opportunity for it and so insistent the necessity, that it may be accurately said that the modern study of disease began in the study of syphilis in this great epidemic.

Both the literature of syphilis in the first half of the sixteenth century, and the knowledge of the disease which it shows is of surprising extent. Proksch, in his enumeration of the most important early writers on syphilis, gives a list of forty authors whose work has come down to us. Among these the most interesting perhaps are Dias de Isla, who treated some of the first cases that returned from America; Paracelsus, who approached the disease with his characteristic independence and openness of mind; and Fracastoro, who in his poem

"Syphilis sive Morbus Gallicus," published in Venice in 1530, immortalized himself by inventing the name syphilis. This name he gave to his hero—from σῦς, swine, and φίλος, lover; a swine lover or swineherd. By this name the disease has since been known.

EARLY KNOWLEDGE OF SYPHILIS

The amount of knowledge of the disease which these early students of syphilis gained, proves how quickly they were capable of independent observation, once they had overcome their bondage to dogmatic authority. Syphilis with its constitutional symptoms was distinguished from the long-known local venereal diseases. The chancre was recognized as the initial lesion of syphilis, and was distinguished from the chancroid, the well known *ulcus molle* of the Middle Ages. The eruptions were recognized, although the different types were not clearly separated. Mouth and throat lesions and loss of hair were described as symptoms of the disease, as were involvement of bones and joints and of the nervous system and internal organs. The infectious character of the chancre and other genital lesions was recognized. Extragenital infection was known to be of common occurrence, such as infection of children from sleeping with syphilitic persons. Paracelsus, as early as 1530, suggested the hereditary character of the disease.

MERCURY AND OTHER REMEDIES USED

Mercury in the treatment of syphilis comes into view almost as early as the disease itself. It had long been used locally in scabies, psoriasis, leprosy and various skin diseases and doubtless it was tried at once for the treatment of the skin lesions of syphilis. The favorite method of its administration was by inunction; but it was also administered by fumigation, by the mouth, and by the application of mercurial plasters. It is an interesting fact, in view of the recent development of arsenic therapy, that arsenic was probably used by Paracelsus as early as 1530. In addition to mercury, guaiacum was highly prized, and various vegetable infusions, sulphur, sulphur baths and other hydrotherapeutic methods were used. Because of the abuse of mercury the drug later fell into disrepute. Much opposition to

it developed, the great Fallopius being perhaps its most distinguished opponent, and symptoms of mercurial poisoning and of syphilis were confused; but mercury never lost first place in treatment.

Paracelsus, in 1530, by calling syphilis "French gonorrhea" began that confusion between syphilis and the local venereal diseases which was well established by the middle of the sixteenth century and which required 300 years of study for its clearing up. This confusion greatly interfered with the development of a clear conception of syphilis and of the local venereal diseases. Nevertheless, in the 200 years from Paracelsus to Astruc many of the problems of syphilis were gradually worked out and a large store of knowledge concerning its phenomena accumulated.

GROWTH OF KNOWLEDGE OF SYPHILIS IN SEVENTEENTH CENTURY

Fernelius (1496-1558) determined that the syphilitic virus could not pass through the normal skin, but that a break in the epidermis was necessary for an infection to occur. He also first indicated the method by which systemic infection spreads from the chancres.

Fallopius ("De morbo gallico," 1563) pointed out the distinction between syphilitic and non-syphilitic condylomas, and by inventing a sort of mechanical protection to prevent infection entitled himself to be called the originator of the centuries-long effort for venereal prophylaxis.

Ambroise Paré (1510-1590) introduced the vaginal speculum, by means of which he studied the vaginal and uterine lesions of the venereal diseases. He first called attention to the indolence of the syphilitic bubo, and added his testimony to that of Paracelsus as to the occurrence of hereditary syphilis.

The danger of transmitting syphilis in medical practice was shown in 1628 by Horst, who reported almost 100 instances of the transmission of syphilis by cupping. He, and Palfey in 1718, established the fact of the infection of midwives and physicians from patients. Colle and Musitano reported infection by kissing and from drinking cups; and Musitano described chancre of the tonsil. Thus, by the beginning of the eighteenth century, all the essential facts in the transmission of syphilis had become known.

Many other additions to the knowledge of syphilis were made in the seventeenth century. The diagnostic significance of the induration of the syphilitic chancre was recorded by Bazin and Guenault in 1628, over 100 years before John Hunter pointed it out. Destructive syphilitic diseases of the nose and mouth, and syphilitic ozena were described. A very full study of syphilitic lesions of bones was made. The recognition of many of the manifestations of syphilis of the nervous system—cerebral gumma, syphilitic meningitis, syphilitic neuralgias, and syphilitic spinal lesions—date from this period. The discovery by von Grafenberg and Severino, in postmortem examinations, of syphilitic lesions of the larynx, trachea and lungs; and the description by Valsalva, Baader and others, of syphilis of the liver, spleen and kidneys, were other notable advances.

Of particular interest is the fact that Lancisi in his work, "De motu cordis et aneurysmatibus" published in 1738, eighteen years after his death, called attention to the relationship of syphilis to diseases of the heart and blood vessels and to anuerysm.

JEAN ASTRUC

The publication in 1736 of Jean Astruc's classical work, "De morbis venereis," constitutes a landmark in the history of syphilis. He contributed little that was original, but by bringing together and critically considering all of the then existing knowledge of the subject, he performed a service for the advancement of the knowledge of syphilis in the eighteenth century which all subsequent students of the disease have recognized. Astruc, also, with Van Swieten, is entitled to credit for his attempts to evolve a rational plan of treatment with mercury, and to check the abuse of the excessive administration of the drug. Van Swieten in particular performed a great service by introducing treatment by means of the administration of mercury within the limits of its physologic effect and by his success in checking the practice of treating syphilis by mercury carried to the point of producing severe salivation. At the time that Van Swieten was doing so much to rationalize the use of mercury, Zittmann introduced his famous decoction, which is entitled to mention because it is the one combination of the "alterative" type which has been able to maintain

a reputation for usefulness in syphilis until the present time. Boerhaave, in his "Aphorisms," published in 1728, analyzed the course of syphilis, thus anticipating by a century the more complete work of Ricord.

MORGAGNI

Among the foremost contributions to the subject in the eighteenth century were those of the great Morgagni on syphilis of the internal organs. In his extensive study of morbid anatomy he established, in a way that ought to have been conclusive for all time, the occurrence of syphilis of the viscera. He described syphilis of the lungs and its complication by tuberculosis; syphilis of bones, and syphilis of the heart and great blood vessels; and he first described syphilis of the cerebral vessels. Morgagni also made valuable contributions to the distinction between syphilis and the local venereal diseases by his studies of the sequelae of gonorrhea; for he described cystitis, prostatis, Cowperitis, and most of the other complications of gonorrhea in the genito-urinary tract.

In the latter half of the eighteenth century Stoll, Planck, von Rosenstein, and Sanchez, demonstrated the occurrence of hereditary syphilis, and even described the occurrence of late manifestations of hereditary syphilis—the *syphilis hereditaria tarda* of later French writers.

During the same period the duality of syphilis and gonorrhea was reaffirmed by such students as Francis Balfour, Hales, Ellis, Tode, Andrew Duncan, Benjamin Bell, Schwediauer and Ernst Horn. Bell and Balfour demonstrated experimentally the duality of syphilis and gonorrhea.

It will thus be seen that by the latter half of the eighteenth century there had been accumulated a great fund of knowledge of syphilis. To enumerate only questions on which doubt was later thrown: The distinction between gonorrhea and syphilis had been rediscovered, and was well along to complete establishment. The enormously important subject of syphilis of internal structures had been well worked out by many investigators. Hereditary syphilis was known and its most important facts described. The dangers and importance

were recognized of extragenital infections, and of mediate transmission of the disease; of infection by kissing and by innocent contact with infected individuals, as of children sleeping with syphilitic parents or of physicians and midwives from syphilitic patients; of infections from surgical instruments, and from contaminated domestic utensils.

JOHN HUNTER AND THE CONFUSION OF THE VENEREAL DISEASES

At this point, John Hunter enters the field, and his work on the venereal diseases marks an epoch in their history; not because of the additions to knowledge which he made, but because of the confusion into which, through his great authority, the subject was thrown by his false views. Hunter's misconceptions of syphilis and his false teaching were due to general doctrines of disease from which he deduced his conclusions; and he fortified these conclusions by the famous experiment on himself in 1767 which he interpreted too narrowly. Hunter made no distinction between chancroid and chancre, and according to his thory the virus of gonorrhea and of chancre was the same. When this virus was inoculated on a "secreting" surface—a mucous surface—it produced gonorrhea; when inoculated on a "non-secreting" surface—a cutaneous surface—it produced syphilis. To establish this theory, Hunter inoculated on a non-secreting surface pus from a gonorrhea, and had the misfortune to infect himself with undoubted constitutional syphilis.

Of course, the explanation, we know now, is that his experiment was made with pus from a mixed infection of gonorrhea and syphilis, but the possibility of such a mixed infection was contrary to Hunter's doctrine of the occurrence of disease. Indeed, the possibility of such a mixed infection was not then recognized, and Hunter, taking no account of this possibility, concluded that his experiment confirmed his view of the unity of syphilis and gonorrhea. Hunter's deductions carried him much further than this. Although he knew fully the findings of his predecessors with regard to syphilis, he denied the occurrence of extragenital infections; the possibility of intermediate transference of syphilis through contaminated substances; the occurrence of hereditary syphilis, and of course, therefore, of the

possibility of infection occurring from a child born syphilitic; and of syphilis of the internal organs. According to his interpretation of his observations he had not seen any of these manifestations of syphilis; their occurrence was contrary to his doctrines of disease; and, therefore, in spite of the great mass of accumulated observations he denied the existence of all of them. Hunter was the great figure in medicine of his time; the evidence of Morgagni and Lancisi and of all the other famous men who had worked in syphilis before him, and the contentions of his contemporaries, like Benjamin Bell, went for nothing. Hunter's views were accepted and after 1767 practically dominated the subject.

It is hard to find a stronger illustration of the mischief wrought by false convictions when backed by a great personality, than is offered by Hunter's unfortunate views. The study of the venereal diseases was hopelessly misdirected, and it was more than half a century before investigators were able to reconstruct a proper conception of the venereal disease.

RICORD AND MODERN SYPHILIS

The history of syphilis from Hunter's time, 1767 to 1837, was one first of confusion, and then of gradual groping into light. The modern knowledge of syphilis dates from Philippe Ricord, whose work in the Hôpital du Midi, Paris, between 1831 and 1860, combined with that of his pupils and followers, established the fundamental part, and the larger part, of our present clinical knowledge of syphilis. Ricord's greatest work was his conclusive demonstration of the specific character of syphilis and of its distinction from gonorrhea, and his analysis of the course of syphilis into the three stages—primary, secondary and tertiary. The establishment of these two conceptions opened a way for the satisfactory study of the disease. He determined the excessive rarity of reinfection with syphilis. He revived the use of the vaginal speculum for the study of venereal diseases, and carefully described vaginal and uterine syphilitic lesions. And, most important, he cleared away the confusion which had misled Hunter, by proving the occurrence of mixed infections of gonorrhea and syphilis, which explained the cases of syphilis arising supposedly from gonorrhea.

Ricord was mistaken in his views on three important subjects. He did not regard gonorrhea as a specific disease, and he held that the secondary and tertiary lesions of syphilis were not contagious. The specific nature of gonorrhea was proclaimed a few years later by Rollet, of Lyons, and the contagiousness of secondary lesions of syphilis was quickly established by the work of Wallace and von Waller. But it is only within very recent years that his views on the non-contagiousness of tertiary syphilis have definitely been proved to have been at least theoretically incorrect.

WALLACE

At the same time that Ricord was doing his early work in Paris, Wallace, of Dublin, was investigating syphilis, and made one contribution to the subject of such importance that he cannot be overlooked in any history of it. He had already in 1835, while Ricord was denying the fact, demonstrated the contagiousness of secondary lesions of syphilis. But his most important contribution was the introduction in 1834, following the suggestion of Williams, of the use of potassium iodid in its treatment. The introduction of the iodids in the treatment of syphilis was the only addition of any remedy of specific value from the time that mercury was introduced with our first knowledge of the disease until 1909. All subsequent experience has shown the great value of this remedy. Its introduction in the treatment of syphilis was a service of vast importance and enormously increased our ability to combat the ravages of the disease.

THE SEPARATION OF THE VENEREAL DISEASES

With the impetus given to the study of syphilis by Ricord, the confusion between the venereal diseases was rapidly cleared away, and the knowledge of syphilis greatly advanced by the French school. Following Ricord's discovery in 1837 of the distinction between gonorrhea and syphilis, Bassereau determined in 1852, by comparative study, the distinction between the syphilitic chancre and chancroid. Rollet and Clerc—who introduced the name chancroid—a little later completely cleared away the confusion between the venereal diseases by establishing the existence of mixed infections of chancroid and chancre, and indeed, of mixed infections of all of the venereal diseases.

During the last quarter of the nineteenth century the clinical distinctions between the venereal diseases, determined by Ricord, Bassereau, and Rollet, have been scientifically established. In 1880 Neisser discovered the specific organism of gonorrhea. In 1889 Ducrey demonstrated in the pus of chancroid and in 1892 Unna demonstrated in the tissue the specific organism of chancroid. And finally in 1905 Schaudinn and Hoffmann discovered the organism of syphilis.

FOURNIER AND DIDAY

The influence of Ricord gave rise to two great French schools of syphilology: that of Diday at Lyons and that of Fournier at the St. Louis Hospital, Paris. Largely through the work of these two great syphilographers and their disciples, clinical knowledge of syphilis has been brought to its present state. Diday and his pupils gave their attention chiefly to the problems of congenital syphilis, and to them is due, in considerable part, the recognition of the importance of syphilis as a cause of hereditary dystrophies and deformities.

The work of Fournier and his disciples ranged over the whole field of syphilis. To Fournier, more than to anyone else, is due the recognition of the importance of syphilis as a cause of degenerative diseases. He was the founder and chief exponent of the modern study of the relationship of syphilis to the problems of society. He first compelled a realization of the difficulties of the problems of the treatment of syphilis. He established the necessity for the long-continued treatment of the disease, and he, more than anyone else, was instrumental in determining the conditions under which the marriage of syphilitics was safe. Fournier's greatest individual work, perhaps, was his demonstration of the causal relationship of syphilis to paresis and tabes, his insistence on the essential identity of these two nervous diseases, and his studies and propaganda on the subject of syphilis and marriage.

Following the French school, the clinical study of syphilis may be said to have been completed during the last fifty years of the nineteenth century. The clinical course of the disease, its pathologic ramifications, and its hereditary manifestations, were worked out to a point of practical completeness. To this work syphilographers in

all parts of the civilized world have contributed their part. Notable among these have been Jonathan Hutchinson in England; Profeta and Pellizari in Italy; Virchow, Heubner, Oppolzer, Auspitz and Erb in Germany and Austria; Taylor, Keyes and Morrow in the United States. The work of these men brought the knowledge of syphilis to as high a point as seems possible of attainment by clinical study.

THE ADVANCEMENT OF SYPHILOLOGY IN THE NINETEENTH CENTURY

It is important to realize what has been done in the clinical study of syphilis, for we are prone at present, in the smug self-satisfaction of recent brilliant discoveries, to underestimate them. The natural history of syphilis had been completely worked out. Hardly a manifestation of hereditary syphilis remained to be discovered. The vast importance of syphilis as a cause of organic diseases has been fully established, and almost completely worked out. Its causal relationship to certain degenerative diseases of the nervous system had been established. The problems of its relationship to marriage had long been stated; their importance emphasized; and the necessary factors of safety established. The extremely intricate and important problems of treatment had been determined and in large part successfully solved. Syphilology, in short, had achieved all that could be achieved by clinical methods through the most painstaking study, the highest order of intelligence, and self-sacrifice and courage—for the study of syphilis has meant self-sacrifice and courage—and it could court comparison in the extent of its achievements with what has been done in any other disease.

Nevertheless, momentous questions in relation to syphilis remained to be settled. The organism had not been discovered. While the treatment of syphilis presented the most brilliant example that specific treatment has to offer, excepting only that of diphtheria, and perhaps of malaria, important problems remained to be solved in the treatment of syphilis. Most important of all, it had not been found possible to inoculate syphilis into the lower animals, so that animal experimentation with syphilis was impossible. And until the study of syphilis could be carried out on animals many of its questions must remain unsettled. It was in these fields that syphilis found its

problems confronting it at the beginning of the twentieth century. The nineteenth century closed the clinical epoch in our knowledge of syphilis. How well the twentieth century has begun on its problems remains to be considered.

CHAPTER III

THE HISTORY OF SYPHILIS IN THE TWENTIETH CENTURY

The situation at the beginning of this century proved ripe for a great advance in our knowledge of syphilis. Beginning with 1903 one important discovery in syphilology followed another with a rapidity that is without parallel in any other disease.

In 1903 Metchnikoff and Roux demonstrated that syphilis was inoculable in apes.

In 1905 Schaudinn and Hoffmann ended the long search for the organism of syphilis by the discovery of the *Spirochaeta pallida.*

In 1906-1907 Wassermann, Neisser and Bruck applied the serum-complement reaction of Bordet and Gengou to the diagnosis of syphilis and developed as a practical test for syphilis what is now known as the Wassermann reaction.

In 1911 Noguchi succeeded in cultivating in vitro the *Spirochaeta pallida* and completed the proof of the specificity of this organism by reproducing the disease in animals from his cultures.

In the meantime there had been the development of arsenical chemotherapy of syphilis, begun by Uhlenhuth and carried forward so amazingly by Ehrlich by the introduction in 1909-1910 of salvarsan.

IMPORTANCE OF THE DISCOVERIES

Some of these discoveries reveal the fundamental facts of syphilis, and they have opened up the whole subject to exact scientific study. The result is that within ten years the entire field of clinical syphilis has been critically examined. Our clinical knowledge obtained by centuries of painstaking observation of the disease in man has in a few years been reviewed and controlled by animal experiments. Facts established by clinical study have been confirmed; many problems have been solved which before were impossible of solution; and there has been added an immense accumulation of new exact facts.

DISCOVERY OF THE INOCULABILITY OF APES

The most important of these discoveries was that of Metchnikoff and Roux, that syphilis could be inoculated into apes. It was an essential fact; for without the ability to produce a disease at will in lower animals, it is impossible to make a thorough study of it. This discovery made it possible to utilize immediately the knowledge of the specific organism of syphilis and the Wassermann test for a complete investigation of syphilis, and has been chiefly responsible for the amazing increase in our knowledge of it.[1]

Metchnikoff and Roux' successful inoculation of the chimpanzee was the end of a long line of attempts to produce syphilis in animals. John Hunter, who was an idefatigable experimenter, tried and failed in the experiment, and unsuccessful efforts have repeatedly been made by other investigators. Of course, the ape would suggest itself as the most likely animal for this experiment, and from Auzias-Turenne in 1866, to Nicolles, and Maurice in 1892, and Charles in 1903, many unsuccessful attempts at the production of syphilis in apes had been made. It is an interesting fact that in 1879 Klebs claimed that syphilis could be inoculated in apes, and that in 1881 Hensell announced that it could be produced in the eye of the rabbit—a fact which has recently been confirmed; but these discoveries then failed of confirmation by other investigators.

EXPERIMENTAL SYPHILIS

Metchnikoff and Roux' first inoculations were done in chimpanzees. This was soon followed by the discovery that other apes, monkeys, the rabbit, the guinea-pig and some other animals were susceptible to inoculation in a few sites, so that the material for animal experimentation in syphilis now is fairly abundant. The higher anthrapoid apes, however, are the only animals which develop typical systemic syphilis; in them its manifestations can be studied. The lower monkeys, for the

1. For an elaboration of this statement the reader is referred to Churchman, John A.: The Value of Animal Experimentation as Illustrated by Recent Advances in the Study of Syphilis, THE JOURNAL A. M. A., April 29, 1911, p. 1244. Republished as Pamphlet 20 in the Defense of Research Series, which can be obtained on application to the American Medical Association.

most part, and other animals which are susceptible to inoculation develop only the initial lesion of syphilis, or show an eruption around the site and an invasion of the adjoining glands, or at most an atypical systemic infection, so that they are available only for a limited study of the disease.

Fortunately, recovery from syphilis is quick in animals, and there is, accordingly, no danger of its spread among animals. How great has been the value of animal experimentation in syphilis will be seen in our consideration of the subject. It has rendered it possible for our knowledge of syphilis to be put on an entirely new footing in ten years.

THE SPIROCHAETA PALLIDA

The discovery of the *Spirochaeta pallida*, the specific organism of syphilis, reveals, of course, the fundamental fact of the disease. This discovery was the successful end of one of the most zealous searches in the history of medicine. From the earliest days of syphilis it has been recognized that the disease is due to a specific virus; even in the middle of the sixteenth century an animal virus was suggested. In 1837, before the days of modern bacteriology, Donné found vibrios in syphilitic lesions which he described as the probable cause. Since the beginning of bacteriology as a science, the search for the syphilitic organism has been incessant, and many premature announcements of its discovery have been made.

Schaudinn and Hoffmann announced their discovery of the *Spirochaeta pallida* as the specific organism of syphilis in May, 1905. Previous to that time, Klingmüller and Baermann had determined through animal experiments that the virus of syphilis did not pass through a porcelain filter. This discovery, which was confirmed by Metchnikoff, showing that the organism of syphilis was not ultramicroscopic in size, stimulated anew the search for it; although it cannot be said that this fact was the direct inducement to Schaudinn and Hoffmann to study the subject. The latest of these discoveries, before the discovery of the *Spirochaeta pallida*, was Siegel's "cytoryctes luis." Siegel's supposed organism is in itself entitled to little consideration, but it will always have a historic interest because it led the German Academy of Science

to appoint a commission to consider Siegel's claims. This commission deputized the investigation of his work to Fritz Schaudinn, a protozoologist of distinction, and Erich Hoffmann, an expert syphilologist. It was this investigation which led to their discovery of the *Spirochaeta pallida.*

As Metchnikoff and Roux succeeded where others had failed in inoculating syphilis into apes, so Schaudinn and Hoffmann succeeded in discovering a specific spirillum in syphilis after the disease had been unsuccessfully studied by other investigators with especial reference to the possibility of its being due to such an organism. Men of such expertness as Metchnikoff and his assistant, Levaditi, almost at the same time had made a careful search for specific spiral organisms in syphilitic lesions, and, as Metchnikoff says, in his delightful account of the microbiology of syphilis, had concluded definitely, and formally announced, in 1904 that syphilis was not due to a spirillum. They had hardly reached this conclusion when Schaudinn found the specific organism, and found it to be of the form that Metchnikoff concluded it would certainly not be.

Metchnikoff says of this work: "We must consider it a particularly fortunate occurrence for science that the discovery of the etiology of syphilis fell into the hands of a man like Schaudinn, a zoologist by profession, who before this work had proved his ability by his research on the spirilla of birds, and that of relapsing fever in man. From his familiarity with the characters of these particular micro-organisms, and as the result of patient inquiry, Schaudinn was able to announce that in the genital organs, both normal and diseased, two varieties of spirilla are to be found; one of these is found in non-syphilitic affections as well as in some ulcerated syphilitic lesions, while the other is only found in syphilis." Schaudinn was able to establish the distinction between these two organisms, and by establishing it clearly he was able, to use Metchnikoff's words, "to overcome the first difficulty which obstructed his work; and by so doing he may be said to have taken the position by actual *coup de maître.*"

Schaudinn and Hoffmann, in their investigation, found this organin all cases of syphilis which they studied. They found it in chancres and in syphilitic papules; in the depths of diseased tissues, and in syphilitic glands; and they found it in no affections which were clin-

ically not syphilitic. Schaudinn and Hoffmann's announcement of the discovery of the *Spirochaeta pallida* was quickly confirmed by investigators all over the world. It has been found in all lesions of syphilis, and in no other.

The final link in the evidence of its causal relationship to syphilis was furnished in 1911 by Noguchi, who cultivated the organism and from his cultures reproduced the disease in monkeys.

The *Spirochaeta pallida* is a long slender spiral organism averaging in length from 6 to 15 microns; that is, in length it is from one to three times the diameter of a red blood corpuscle. It stains with difficulty, and very faintly; hence the name "pallida." The spirals are very sharp and regular, as regular as the most perfect cork-screw, and average from eight to fourteen in an organism. The organism is peculiar in that the spirals are perfect, not only, as is seen in other spirilla, when the organism is in motion, but when it is at rest; even in old spirochetes, the spirals persist with slight irregularity. The organism has three motions; first a rapid rotation on the long axis; second a progressive motion by bending; and third a lashing and twisting motion. Its motions are slower than those of other spirochetes. Its characteristics have been so clearly established that it can be distinguished under the microscope from other spirochetes, so that in the hands of an expert its demonstration can perform the important function of making a definite diagnosis of syphilis in the earliest stage of the initial lesion when no other absolute evidence of the disease can be found.

THE WASSERMANN REACTION

The Wassermann test is the application to syphilis of a general reaction discovered by Bordet and Gengou. The discovery of the test was a deduction from a study of the fixed interactions under given conditions between certain substances which exist in the blood, although the quantity of these substances is so minute that they can only be shown by their activities. The determination of the principle underlying the test, and the establishment of the test by Bordet and Gengou, is one of the most brilliant intellectual feats of the biologic sciences. For the application of the test to syphilis, Wassermann, Neisser, and Bruck are entitled to the credit.

The Wassermann test is a very definite, but a very complex reaction, and a description of the test and a full statement of the reaction is difficult. Briefly, syphilitic blood contains some substance which even in infinitesimal quantities causes that blood, under the conditions of the Wassermann test, to act on sheep's blood corpuscles in a way quite different from that which non-syphilitic blood acts on the same corpuscles. So distinct is the difference between the reaction of syphilitic blood and non-syphilitic blood in the Wassermann test, that this difference furnishes a practical test for syphilis.

Since the introduction of the test in 1907, it has been subjected to unremitting scrutiny, with complete establishment of its reliability. It is, however, a test requiring delicate and careful manipulations and experience in its performance and in the interpretation of its results. It is, therefore, open to abuse through careless performance; but carried out properly and interpreted with an appreciation of the extent and of the limitations of the information which it furnishes, it is, according to universal verdict, a test for syphilis which can be relied on. It is a more useful practical test of syphilis than the demonstration of the *Spirochaeta pallida,* for the reason that it can be elicited in many situations in syphilis in which the organism cannot be demonstrated. In the primary stage of syphilis, before the disease becomes generalized, the Wassermann reaction is not positive; that is, it does not give evidence of the existence of the disease. Fortunately at this time the diagnosis can be made by demonstration of the *Spirochaeta pallida* in the initial lesion. In all other stages of syphilis the Wassermann reaction is the evidence of syphilis which is most likely to be found. It fails to show in a small percentage of cases in which syphilis is active, but it is, nevertheless, the most nearly universal phenomenon of the disease that can be ascertained.

The Wassermann reaction gives us valuable aid in many directions. It is most valuable in clearing up many confusing cases in which syphilis cannot otherwise be demonstrated. It furnishes evidence supplementary to other symptoms of syphilis. It is a valuable guide in the treatment of syphilis. It has been the criterion for the establishment of much of the data obtained from the study of experimental syphilis. But perhaps its greatest use has been in making a general survey of the relation of syphilis to diseases of the body in general.

In this way it has in a few short years performed an invaluable function in confirming our clinical knowledge of the relationship of syphilis to diseases of many organs and tissues in the body, and in extending our knowledge of such diseases.

ARSENOTHERAPY AND SALVARSAN

Ehrlich's development of specific arsenotherapy by the introduction of "606," or salvarsan,[2] and its derivatives, is not only an amazing addition to the treatment of syphilis, but it is the most important application thus far of a new principle in therapeutics. In the search which resulted in the production of salvarsan, Ehrlich set out to find a compound, which, to use his words, was "parasitotropic" for the *Spirochaeta pallida,* but was not "organotropic" for human tissues; that is, which had a very close chemical affinity for the organisms of syphilis, and which by combining with them would destroy them, while it had no affinity for the tissues of the body, and so was not poisonous to man. Ehrlich's efforts in syphilis had precedent in the researches which had been made by Uhlenhuth, Thomas and others with organic arsenical compounds in the treatment of diseases produced by organisms biologically closely related to the *Spirochaeta pallida.* A succession of arsenical compounds had been found which had shown parasitotropic affinity in rats, mice, rabbits, fowls and other animals for the trypanosomes of sleeping sickness, and for the spirilla of fowl spirillosis and of relapsing fever. Some of these compounds had proved curative for these diseases in experimental animals, and had later shown remarkable usefulness in human protozoan diseases. This is notably the case of atoxyl in the African scourge, sleeping sickness. Salvarsan, produced by Bertheim working with Ehrlich, was the culmination of this research in the production of therapeutically active synthetic arsenical compounds. Ehrlich first carefully tested out the effect of salvarsan on relapsing fever in mice, on spirillosis of fowls and on syphilis of rabbits. Ehrlich and his associate, Hata, were able to cure relapsing fever in mice and spirillosis in fowls by safe doses. They had equally brilliant results in syphilis in rabbits. The compound was then given

2. Throughout this work in using the word salvarsan, I have also in view neosalvarsan, and the other derivatives of salvarsan.

to other investigators to use in animal experimentation, and after being tested out carefully for its toxicity on sheep and dogs was cautiously applied to man.

It is interesting to note in passing that the men who volunteered for the first injections to test its effect on man were, as is usual in such circumstances, two physicians, Doctors Hoppe and Wittneben.

With salvarsan Ehrlich made no less an attempt than to cure syphilis by one massive dose of his remedy. His hope was to produce a remedy which was deadly to the parasites and harmless to the patient. In this ambitious attempt Ehrlich has not been entirely successful. He has produced a remedy which is highly parasitotropic for the *Spirochaeta pallida*, and almost free from organotropic properties for human tissues, but, as could only be expected, neither of these qualities of the drug is absolute.

Salvarsan and its derivatives have not been found completely curative in syphilis. If syphilitic cases are treated while the disease is still local—before it has become disseminated through the body—it has been found that by a well-elaborated modification of Ehrlich's plan of treatment syphilis can be promptly and completely stamped out in many cases. Except in these very early cases of syphilis, neither salvarsan nor neosalvarsan, nor any combination of either of these with mercury and the iodids, can be used with assurance that syphilis will be completely eradicated. Nevertheless, almost everything short of the complete destruction of the spirochetes in the human body can be done with salvarsan. It seems to be a fact that with it all spirochetes in the body can be destroyed except those which have found lodgment or have walled themselves off in locations in the body unreached by direct circulation of the blood. Experience now in an innumerable number of cases of syphilis indicates that salvarsan is a remedy of very great value in the treatment of syphilis.

As has been said, Ehrlich also was not successful in making it absolutely harmless. It is the experience with every drug of active properties that there is an occasional individual who is hypersensitive to it—who has an idiosyncrasy to that particular drug. Ehrlich has not been able to avoid this idiosyncrasy. It is, perhaps, true also that some harmful effects of the drug in normal doses are not to be explained by idiosyncrasy to it. But all of the cases of harmful effects produced

by the action of salvarsan are almost negligible when compared with the thousands of cases in which it can be used without any disturbing effect whatever. It is harmless to a degree which renders its use practically safe; as safe as any remedy may reasonably be hoped to be which has a powerful effect. In the treatment of syphilis it has been found that, with all of its value, salvarsan has not enabled us to do away with mercury and the iodids; the two remedies which all experience has shown to be of specific use in syphilis. And most of the disappointment which has arisen in the use of salvarsan has been from the failure to combine its administration with that of mercury. The two together furnish us our best defense against syphilis.

In describing these recent achievements in syphilology, I am conscious of using superlative terms. But no other terms accurately describe them. The discoveries of Metchnikoff and Roux, and of Schaudinn and Hoffmann are basic and epochal. The researches of Bordet and Gengou, and of Ehrlich are as brilliant exercises of the mind as can readily be cited. The last word in syphilis has doubtless not been said, but at least some of the most important chapters in its history have been finally written in the last twelve years.

CHAPTER IV

THE COURSE OF SYPHILIS

The Incubation Period and the Primary Stage

The course of syphilis falls naturally, as was pointed out by Ricord, into several stages. While a too rigid interpretation of the limits of the stages may lead to mistakes, their recognition has rendered much easier a clear conception of the course and symptoms of the disease.

First, there is an incubation period of approximately four weeks, from the time of infection to the appearance of the initial lesion or chancre. During this time there is no evidence of the impending disease.

Second, comes the stage of the chancre called the *primary stage,* or secondary incubation period, lasting about six weeks. During this period, which is terminated by the sudden appearance of the eruption, the infection gradually invades the whole organism.

Third, we have what is called the *secondary stage* beginning with the appearance of the eruption and only ending with the disappearance of evidences of an active systemic infection. This stage has no such sharp limit as the preceding. It may last for a few weeks or several months or a year or more and its end is indicated by the disappearance of symptoms of a general infection.

Fourth, following the secondary stage there may occur the *tertiary stage* characterized by the presence of lesions due to isolated local infections. The tertiary stage does not occur in many cases of syphilis, and is really not a sharp chronologic stage of the disease. The primary and secondary stages represent the normal and almost invariable evolution of syphilis.

To put it in a less didactic form, we have first in syphilis an incubation period before the appearance of any lesion. We have, then, after the appearance of the chancre, another period during which the disease shows only a local lesion but is gradually invading the system.

Then suddenly an eruption appears which ushers in a period characterized by numerous symptoms indicating that we have a generalized systemic disease.

ANALOGY OF SYPHILIS TO OTHER DISEASES

Syphilis thus presents analogies to three types of diseases. At first it is a local infection represented by a local lesion. Then as it passes into the secondary stage, it resembles the acute specific infections, especially the eruptive fevers. In its tertiary stage its lesions are localized foci of inflammatory tissue known as granulomata which characterize such chronic infectious diseases as tuberculosis and leprosy. The secondary manifestations of syphilis are those of an acute systemic disease. The tertiary manifestations are those of a chronic disease, sharply localized in its activity. The manifestations, therefore, of secondary and of tertiary syphilis differ very much, but it was the great service of Virchow to show that the pathologic processes in the lesions themselves are essentially the same throughout the entire course of the disease.

THE FIRST INCUBATION PERIOD OF SYPHILIS

The first event in the course of syphilis is the inoculation of *Spirochaetae pallidae* into the skin. For this to occur there must be a break in the epidermis. Clinical experience has long shown that the unbroken skin furnishes protection against infection with syphilis, and the experiments of Neisser and others on animals have shown conclusively that inoculation through the unbroken skin cannot be produced. Unfortunately, however, the favorite site for the growth of the *Spirochaeta pallida* is very superficial in the skin, so that minute breaks in the skin which are easily overlooked—which may in fact be microscopic—furnish the readiest means of inoculation. After inoculation no evidence of the disease is immediately forthcoming. The abrasion may entirely disappear, and the patient is without any evidence whatever of the infection. During this time the spirochetes are multiplying. At first their growth is not abundant, and it is only after a considerable time that they have increased to a number sufficient to produce any evidence of their presence.

There is a good deal of room for surmise as to the reason for the very slow incubation of syphilis. The most plausible reason seems that when the spirochetes are introduced they only slowly develop power of growth in their new host, so that two weeks or more are spent in becoming acclimated, as it were, to their new surroundings. From that time their growth is luxurious and their spread rapid.

THE CHANCRE

The first evidence of infection with syphilis is the appearance of the chancre. The interval between infection and the appearance of the chancre is usually about four weeks. It may be a little longer, or a little shorter, but only in rare cases does it vary more than two weeks on either side of this period. The chancre is usually a single, indolent, small, round superficial ulcer or excoriation. It has a button-like indurated base. It is usually located on, or about the genitals, but may be on the mucous membrane of any of the orifices of the body or anywhere on the cutaneous surface. The chief features of the initial lesion are its apparently harmless character and its persistence. It is practically painless, is associated with no systemic disturbance, and gives no intimation in itself of the serious nature of the infection which it represents. The only indications of its importance lie in its induration and its indolence; it neither gets better, nor worse, but persists for two, three, or four weeks before it shows any tendency to heal.

The next event in the evolution of the disease is the development, eight to twelve days after the appearance of the chancre, of hard, painless, slight swellings of the adjacent glands. This symptom is almost invariable. At the end of three or four weeks, there is involvement of glands in distant parts of the body, and from one to three weeks after this—usually just after the chancre has healed after an existence of five or six weeks—a generalized eruption appears.

EXPERIMENTAL KNOWLEDGE OF THE CHANCRE

Recent investigations have thrown much light on the processes of invasion of syphilis. Experiments have confirmed clinical experience that the most favorable sites for the inoculation of the *Spirochaeta pal-*

lida is the external surface of the body. In man and the higher apes inoculation is successful anywhere on the skin, but even in them it must be a superficial inoculation. In the less susceptible monkeys inoculation can only occur on the sites particularly susceptible, namely, the genitals and the eyebrows, and in other animals only in special locations. Squamous epithelium is the peculiar type of epithelium in which the organism most readily finds lodgment. The entire cutaneous surface is covered by such epithelium, as is the mucous membrane lining the orifices of the body.

Experimental inoculations of syphilis into the subcutaneous tissues have nearly always been negative; in other words, deep wounds are less likely to be inoculated with syphilis than are superficial abrasions. Intraperitoneal inoculations have always been negative. Direct inoculation into the blood is almost, but not quite, impossible. Indeed, the only exception to the fact that primary inoculation with syphilis can only, with rare exceptions, be made in the skin or mucous membrane, is the fact that inoculation can be made with ease into the tissues of the testis. As the experiments on the lower apes indicate, the tissue of greatest susceptibility to inoculation with syphilis is the covering of the genitals, and if one is inclined to speculation as to the origin of syphilis, this fact leads to the hypothesis that the *Spirochaeta pallida* at one time was a saprophyte whose habitat was the genitals, and that it gradually acquired parasitic virulence.

Neisser's experiments have shown that the results of inoculation largely depend on the quantity of spirochetes introduced. For successful inoculations material containing a large quantity of spirochetes must be used. The length of the incubation period in experimental syphilis likewise depends on the quantity of spirochetes used in inoculation. The shorter incubation periods come from the use of a large number of the organisms.

Many experiments show that even before the time of the appearance of the chancre, the disease has spread widely into the contiguous lymphatics. This is confirmatory of clinical evidence, and explains the failure of the attempts which have long been made to prevent the development of syphilis by the excision, or the destruction in other ways, of the chancre, even on its earliest appearance. Excision of the infected site must be done within twelve hours after

infection to prevent syphilis. Indeed, Neisser's work demonstrates that the blood and the internal organs of monkeys may contain the spirochetes comparatively early in the incubation period, and many days before the development of the chancre.

SYPHILIS WITHOUT CHANCRE

It is a not infrequent experience to see syphilis without the history of the previous occurrence of a chancre. Most of these cases are undoubtedly explained by the fact that the chancre occurred in some concealed location, usually about the genitals, and escaped observation. The possibility, however, of the occurrence of syphilis without the previous occurrence of an initial lesion has long been conjectured and supported on the basis of clinical experience by such authorities as Jonathan Hutchinson.

Neisser and others in a few successful experiments have been able to inoculate syphilis directly into the blood of apes and thus produce the systemic disease without the occurrence of the chancre. The failures in this experiment have, however, been far more numerous than the few successes, and under the conditions of the experiment a vastly greater quantity of virus is used than comes into play in the practical circumstances under which accidental inoculations might occur, as from a contaminated instrument point pricking the skin of a surgeon. So, while these successful inoculations into the blood demonstrate the theoretic possibility of the occurrence of syphilis without chancre, yet all the facts of the experiments tend to indicate that the practical occurrence of syphilis without chancre through inoculation into the blood is almost impossible.

TIME AFTER INFECTION BEFORE SYPHILIS BECOMES GENERALIZED

Although at the time of the development of the chancre there is a considerable dissemination of the spirochetes, yet as indicated by the Wassermann reaction, the disease has not as a rule become systemic in the early days of the chancre. More than a week usually passes after the appearance of the chancre before the Wassermann reaction becomes positive, and this period may be extended occasionally to two weeks. During this time the *Spirochaeta pallida* can be demonstrated

in abundance in the chancre, so that a conclusive diagnosis of syphilis can be made. This period, after the appearance of the chancre and before the disease has become systemic as shown by the Wassermann reaction, has assumed a place of very great practical importance; for clinical experience has shown that, during this short time before the appearance of a positive Wassermann, there is a fair chance of aborting the disease—of completely cutting short its further course—by vigorous treatment begun at this time. After this short period has passed, the chance of aborting the disease, no matter how thorough the treatment, decreases with great rapidity. This first one or two weeks of the chancre is the golden opportunity in syphilis; an opportunity which we could not utilize until recently, for before we were able to demonstrate the *Spirochaeta pallida,* it was impossible to make a positive diagnosis of syphilis in the first week of the chancre.

REINOCULATIONS OF SYPHILIS AND MULTIPLE CHANCRES

Reinoculations repeated at short intervals have also thrown light on the time when syphilis becomes systemic. After an individual becomes syphilized, and certainly as long as his syphilis remains active, he cannot be reinoculated with the disease. He produces in his blood, as in the case of other contagious diseases, antibodies which prevent the lodgment of a new invasion of spirochetes. The typical chancre is single; occasionally chancres are multiple. Long since, however, Rollet, Wallace, Fournier and others have shown experimentally the possibility of producing multiple chancres by auto-inoculation of the patient in the early days of the chancre. These experiments have given good ground for the surmise that when multiple chancres occur they are due to several inoculations at the same time, or within a very short interval. Animal experiments of recent years have confirmed the earlier experiments of Wallace and Rollet and others, and have shown that the production of multiple chancres in an animal by auto-inoculation is easily possible up to approximately ten days after the first infection. The explanation of these experiments is that during these ten days the dissemination of the spirochetes has not become general, and has not stimulated a sufficient production of antibodies by the animal to produce immunity to further infection. In short, these

experiments confirm the evidence of the Wassermann reaction of the existence of a brief period after the first appearance of the chancre when the disease has not become systemic and when, as a recent clinical experience has shown, it is amenable by modern methods of treatment to complete eradication. This is one of the most important practical facts in our present knowledge of syphilis.

CHAPTER V

THE COURSE OF SYPHILIS (Continued)

The Secondary Stage

Symptoms of Secondary Syphilis; Eruption.—The appearance of the eruption is the final evidence that syphilis has become established as a systemic disease. This eruption, which appears on the mucous membranes of the mouth and genitals as well as on the skin, is of symmetrical distribution and varies in extent and intensity between the widest limits. It may consist of only a few pink spots on the front and back of the trunk, or may be a pustular eruption as extreme as that of a severe case of smallpox. As a rule, except in persons of low resistance to syphilis and in whom treatment has been neglected, the eruption is usually of moderate severity, is only slightly disfiguring, and is the source of no discomfort.

The other symptoms of secondary syphilis are those of a general infection of subacute intensity. The glandular enlargement, which began in the primary period, persists, and is likely to become more distinct in the early part of the secondary period. This is not confined to adjacent glands, but is an expression of the general infection and occurs to a varying degree in distant glands. As a rule, the only glands demonstrable, except the glands regional to the primary lesion, are the epitrochlears and the posterior cervical glands. Occasionally, however, many glands are palpable. The hyperplasia is usually slight but occasionally it is exaggerated. The adenopathy of secondary syphilis is, as a rule, one of the last manifestations to disappear.

Systemic Symptoms.—In addition to the eruption, and the adenopathy, the symptom complex may include fever, rheumatoid pains, insomnia, anemia, more or less cachexia, and other evidences of toxemia. These constitutional symptoms are usually slight, and frequently, aside from some feeling of general depression, are entirely absent. In a certain proportion of cases, however, they are very dis-

tinct, and in rare cases their manifestations are intense. The general depression of syphilis, or the syphilitic cachexia, consists of such symptoms as accompany toxic fevers and anemia; a certain loss of appetite, with weakness, dejection, nervousness and, perhaps, emaciation and pallor. These symptoms may occur in the beginning of syphilis, or they may occur several months later. They are seen especially in persons who are not vigorous, or who are poorly cared for. As a rule in secondary syphilis none of the symptoms is of a character that would, of itself, cause alarm. The patient is not acutely ill, and suffering is slight or absent. The chief troubles are the social complications and the mental depression which the patient with syphilis often has. A certain amount of mental depression is a part of the physical picture of syphilis, but of far greater importance than this is the excessive psychical depression which occurs in many patients from the mere knowledge of the fact that they have syphilis. Were it not for its social complications, for syphilophobia, and the vague terrors of late syphilitic complications, secondary syphilis—the acute stage of the disease—would be unimportant.

Of course there are exceptions to the benign course of secondary syphilis which I have outlined. Perhaps the variations in the course are in part due to the variation in the virulence of different strains of spirochetes, but it is probable that they are due chiefly to variations in the resistance of individuals to syphilitic infection. In one patient such resistance will be developed by the body that the disease will be cured without treatment. In the average patient with intelligent treatment, the course is such as I have outlined. An occasional patient has little natural resistance to syphilis, and in such a case the symptoms are exaggerated. In rare cases the natural resistance of the body utterly fails to respond to the attack of the spirochetes, and in these cases the disease reverts to the extreme severity exhibited in the early epidemics of syphilis. These cases are so rare as to constitute clinical curiosities. Omitting these exceptional cases, secondary syphilis is a disease the symptoms of which are easily amenable to rational and specific methods of treatment that have stood the test of long experience.

The symptoms of secondary syphilis are in part due to a systemic intoxication, and in part to the local growth of organisms at the sites

of the lesions. While for the most part the two sorts of symptoms may be separated, yet it is impossible to say at times whether a symptom belongs in the one or the other of these categories. The anemia, the cachexia, and the febrile disturbance are symptoms of the general intoxication. The glandular enlargements, and the eruptions for example, are due to a proliferation of the *Spirochaeta pallida* in these sites, and the wide extent and symmetry of the lesions indicate how general the dissemination of the syphilis has become. The origin of some other symptoms is not so definite. The headache and bone pains and neuralgias may be manifestations of the general intoxication, as such symptoms are manifestations of many other intoxications. On the other hand, they may be the result of the local growth of foci of spirochetes such as produce lesions of the meninges of the brain or spinal cord, or of bones or periosteum.

DURATION OF SECONDARY STAGE OF SYPHILIS

The secondary stage of syphilis has no sharply defined duration. It may be measured by a few months, or extend over two or three years. In treated cases it may never develop, or its symptoms may last for only a few days or a few weeks. In other cases the symptoms disappear in the course of several months. After a year in well-treated cases it is unusual to see evidences remain or symptoms recur. After the first year any symptoms of secondary syphilis that recur are sporadic. This very important subject will be considered more fully in connection with syphilis and marriage.

CHRONICITY AND INDOLENCE OF SYMPTOMS

The chronicity and indolence of the symptoms of secondary syphilis represent the chief departure from its resemblance to other acute infectious diseases. Paradoxical as it may seem, the very slight activity of the syphilitic infection, as manifested by the indolence and chronicity of its symptoms, is the reason for its success in its permanent invasion of the body. In measles, scarlet fever, or smallpox, for example, the attack of the invading organism is sharp and hard, and immediately stimulates all of the defensive forces of the body to repel and destroy the invaders. With syphilis, on the contrary, the attack of the infection is slow and insidious, and the response of the body

to the invasion correspondingly less vigorous. Immunity is thus slowly established, and in most cases never reaches a degree where it can completely destroy the infection. As a result permanent foci of infection become established against which the only defensive response of the tissues is the slow reaction of the fixed connective tissue elements of the infected area.

SYPHILIS WITHOUT ERUPTION

In a considerable number of cases the eruption of syphilis, both on the skin and mucous membranes, is surprisingly slight. I have seen a very ugly chancre of the lip with enormous enlargement of the glands under the jaw in a patient whose entire cutaneous eruption consisted of a few faint pink macules which disappeared within forty-eight hours without vigorous treatment. Syphilitic patients are frequently encountered in whom the eruption is so trivial as to escape observation. It is likely, therefore, that the eruption, both on the skin and the mucous membranes, is inconspicuous to a degree that escapes observation in a relatively large number of cases; and it fails entirely to occur in some cases. Stern, in a recent article, maintains that from 30 to 40 per cent. of all cases of syphilis never show skin or mucous membrane symptoms, and that in this proportion of cases syphilis remains an internal disease. My own experience compels me to feel that this is a vast overestimate of the proportion of such cases. The cases in which it is impossible to get a history of a secondary eruption are, as a rule, cases in which careful observation to discover the eruption has not been made, so that this history of no eruption indicates not so much the entire absence of eruption in the cases as its slight intensity. Solely on the basis of impressions I should say that Stern's figures of from 30 to 40 per cent. is largely in excess even of the proportion of cases in which the eruption is not observed. Nevertheless, the number of cases in which no history of secondary eruptions can be gotten represents a material proportion of the entire number of cases.

LATENT SECONDARY SYPHILIS

In a very large percentage of cases of secondary syphilis manifest symptoms quickly subside, leaving the patient to all appearances free

from evidences of the disease. This happens spontaneously in many cases and it is the usual course of vigorously treated cases, even when the treatment is not able to eradicate the disease. The natural defenses of the body, or these aided by treatment, are able to subjugate the disease to the point where it becomes latent so far as any outward evidence is concerned. In these latent cases vigorous and otherwise healthy individuals may have no appreciable disturbance of the health or of the feeling of well-being. This, as a matter of fact, is the frequent experience. In other cases there may be pallor, anemia, some cachexia, and considerable lowering of the patient's vitality. In all of these latent cases a skilful search usually demonstrates some objective symptoms of the disease. A common manifestation found is the persistence of characteristic enlarged glands. Even more frequent than enlarged glands is the evidence given by a positive Wassermann. Occasional mucous patches may occur, and various isolated symptoms such as pigmentary changes in the skin or a few papules on the palms may persist.

These latent cases of secondary syphilis often offer the greatest practical difficulty in the way of treatment, for, in the entire absence of any evidence of the disease appreciable to the patient, it is difficult to hold irresponsible individuals to the measures of treatment necessary for the control of the disease. It is the general clinical experience that these latent cases of syphilis represent a large percentage of the cases which show late serious effects of syphilis in the deep tissues of the body. The obvious conclusion, of course, is that this happens because on account of the trivial manifestations of the disease such cases fail to have thorough treatment. This explanation undoubtedly in part covers the fact. On the other hand clinical experience tends to show that these cases of syphilis running a light secondary course are, regardless of the treatment factor, actually more likely to have serious manifestations of tertiary syphilis than cases which show severer cutaneous and other characteristic symptoms during the secondary stage.

WHY THE MANIFESTATIONS OF SYPHILIS VARY IN DIFFERENT CASES

The hypothesis offered to explain this probable fact is the following: In any given case the brunt of the attack of secondary syphilis

is borne by a few tissues in the body. As a rule the skin is most involved in secondary syphilis, but in other cases the chief attack is made on some of the deeper tissues of the body, and the manifestations of the disease in these deeper tissues, obscured from observation, show no evidence of their occurrence. In the tertiary period the lesions occur in tissues in which the foci of infection were planted during the secondary period; the result is, therefore, that cases in which the cutaneous symptoms are most manifest in the secondary stage are most likely to show tertiary lesions in the skin and subjacent structures, while cases in which the deeper structures were chiefly invaded during secondary syphilis, and in which the cutaneous symptoms were slight, are those which are correspondingly likely to show the serious manifestations which come from tertiary syphilis in the viscera, in the nervous system, and in the blood vessels. Nichols, indeed, deduces from his experiments that the presence of a focus of syphilis in one tissue may inhibit the development of syphilitic lesions in others.

Why syphilis should vary in the tissues which it chiefly attacks in different cases is the source of a good deal of speculation. The first reason probably is that the same structures in different individuals vary somewhat in their susceptibility to different infections. Another way of stating this is that what is the weak point in one person may not be the weak point in the next, and syphilis, like other infections, is most likely to engraft itself successfully on those structures which represent the individual's place of lower resistance. In the usual patient, the structure most susceptible to syphilis will be the skin; in another, for reasons peculiar to the individual, it will be the nervous system; in the next, the bones; and in the next, the arteries.

Another explanation offered for the variation in the structures affected in different cases, is variation in the strain of the spirochetes. In support of this hypothesis, is urged the frequency of severe syphilis of the nervous system in the absence of severe manifestations of the disease elsewhere, and the observation frequently made of the similarity in course of cases of syphilis known to be of the same origin. In this connection particular weight has been given to conjugal syphilis, in which the disease in husbands and wives has exhibited the same characteristics, especially in its invasion of the nervous system. The recent statistics of Fischer do not seem to bear this out: He reports

on 395 married paretics—319 men and 76 women. Of these 395 married paretics, only 10 cases, or 2.53 per cent. were conjugal cases, that is, occurred in both husband and wife.

Whether these explanations are true or not; whether indeed the mild secondary cases furnish an undue proportion of serious tertiary accidents, the fact is certainly beyond question that the cases that run a mild secondary course and the latent cases offer no exemption from the dangers of tertiary syphilis and require the same thorough painstaking treatment.

CHAPTER VI

THE COURSE OF SYPHILIS (Continued)

Tertiary Syphilis

All of the symptoms of tertiary syphilis are due to the activity of localized foci of syphilitic infection. These manifestations represent two types of lesions; first, the gumma of syphilis, and second, a diffuse sclerosis, or scar tissue formation following plates or thin areas of gummatous infiltration. These two types of lesions are identical in origin and structure, but clinically they present differences which justify their distinction.

A gumma is a mass of inflammatory tissue from the size of a pin head to that of an olive or larger. It is usually round, or oval, or disk shaped. It is at first a firm vascular tumor, but it soon softens, breaks down at the center, and, if opportunity occurs for it to open on a free surface, forms an ulcer. In any case it is followed by scar tissue which replaces the normal tissue in which the gumma occurred. It is thus a lesion which is destructive to tissue which it invades, and as gummas may be large and numerous the damage done by them may extend to very wide limits.

The symptoms of tertiary syphilis, like those of tuberculosis, may be direct and confined to the lesions, or they may include a wide variety of indirect manifestations. The gravity of the symptoms of gummas depends altogether on their location. A gumma occurring in the skin produces a characteristic ulcer, the symptoms of which are local. At the other extreme, a gumma occurring in the brain may produce all of the symptoms of a brain tumor, with disturbances of brain functions depending altogether on the location of the gumma and on the tissues consequently impaired in function or destroyed. No tissue in the body is exempt from the lesions of tertiary syphilis, and among its manifestations are included in different cases symptoms such as arise from damage to any structure in the body.

STRUCTURES INVOLVED IN TERTIARY SYPHILIS

The frequency, however, of tertiary syphilis in different structures in the body varies greatly, because of the varying susceptibility of different tissues to syphilitic infection. The skin comes first in the frequency of the manifestations of tertiary syphilis. Next in the order of their frequency come the nervous system and the bony structures. Other structures which are frequently involved are the testis and the walls of the blood vessels.

Syphilis of the Viscera.—Tertiary syphilis of the viscera is less common, but is by no means rare, and as the newer methods of diagnosis are enabling us to recognize syphilis more frequently than formerly, the rôle of syphilis in the causation of diseases of the deeper structures of the body is becoming increasingly important. The liver furnishes the largest proportion of cases of tertiary syphilis of the viscera, and the spleen is not uncommonly involved. The lungs, the esophagus, the stomach and the intestines, the pancreas, the muscles and the peripheral nerves rarely show tertiary syphilis. It is a very striking fact, in view of their being purely genital structures, that the body of the uterus, and its analog in the male, the prostate, are probably the most rarely involved in tertiary syphilis of any structures in the body. The kidneys are frequently affected in secondary syphilis, but the affection is a toxic nephritis like that occurring in many infectious diseases, and is not due to a specific syphilitic process. True tertiary syphilis of the kidneys is rare. Involvement of the kidneys secondary to vascular changes produced by syphilis is one of the commonest late complications of the disease.

In the foregoing outline of the location of the lesions of tertiary syphilis, typical gummas have been chiefly in mind. The other form of late syphilitic lesion, the lesion which forms in a sheet-like gummatous infiltration, and is followed by sclerotic changes in the involved tissues, requires, because of the difference in its clinical manifestations, some separate statement. These sclerotic lesions, while less frequent, are the most formidable lesions of syphilis. The occurrence of gummas is likely to be manifested by symptoms so distinct that the lesions will be discovered; and gummas are, as a rule, easily amenable to treatment. In contrast with this, the sclerotic changes of late

syphilis are slow in course, and they give little or no symptomatic evidence of their occurrence until their damage has been in part completed and is beyond repair. In addition, the sclerosing lesions of syphilis are much less amenable to treatment than the typical gummatous lesions of syphilis. These two factors of insidious course and intractability to treatment combine to make this form of late syphilis the most serious of all the manifestations of the disease.

The sclerotic lesions occur in the liver and testis, in the heart muscle, in the coats of the blood vessels, and in the central nervous system. In all of these structures, except the testis, their occurrence produces serious damage to the human machine. Syphilis of the heart muscle itself is rare, but irremediable damage to the heart muscle because of syphilis of the coronary arteries is a familiar manifestation.

Syphilis of the Blood Vessels.—Syphilis of the arteries is the commonest serious result of the disease. The attacks of syphilis fall frequently on the coats of the large arteries, and all recent experience confirms the opinion, as old as Lancisi and Morgagni, that syphilis is the great cause of aneurysm.

Vastly more important than this, because of its frequency, is the rôle of syphilis in the cause of premature arteriosclerosis. Arteriosclerosis, more than any other one factor, is the slow cause of old age and senile death, and there is no other disease that equals syphilis in hastening the onset and progress of arteriosclerosis. In the words of Osler and Churchman, "On no system does the virus of the disease fall with greater intensity in all stages than on the blood vessels; it is safe to say that through the arteries syphilis kills more than through any other channel."

Syphilis of the Nervous System.—Syphilis of the central nervous system is of frequent occurrence. It may be due to gummatous lesions or to sclerotic processes producing degenerative changes. The gummatous processes of syphilis of the central nervous system, whether occurring in the arteries or in other structures of the brain and cord, while dangerous and rapidly producing serious destruction if left unchecked, are amenable to specific treatment. They can be controlled, and by prompt and vigorous specific treatment can be checked before serious damage is produced. The degenerative syphilitic diseases of

the brain and cord—tabes and paresis—insidious in course and only in part controllable by treatment, form, with syphilis of the arteries, the most difficult of the manifestations of the disease.

Paresis and Tabes.—Paresis—softening of the brain—and tabes—locomotor ataxia—have been recognized, since the work of Fournier and after him of Erb, as diseases of the central nervous system having a direct relationship to syphilis, but, chiefly because of the intractability of these diseases to syphilitic treatment, the preponderating view has been that while these diseases are the result of syphilis—are parasyphilitic—they are not manifestations of syphilis itself. All recent progress in our knowledge of syphilis has tended to confirm their essential syphilitic character. The Wassermann reaction has been found to be positive in tabes and paresis as frequently as in the frank lesions of syphilis. The chain of evidence has finally been completed and the fact that tabes and paresis are manifestations of active syphilis established by Noguchi, who in 1913 found the *Spirochaeta pallida* in the brains of the patients in six cases of paresis, and in the cord in one case of tabes.

Noguchi's findings have been abundantly verified and amplified. As final evidence, Forster and Tomasczewski demonstrated living spirochetes in the brain tissue of living paretics. Tabes and paresis are manifestations of syphilis of the brain and spinal cord, and they are, as was pointed out by Fournier, essentially the same process, differing only in the parts of the central nervous system involved.

CHAPTER VII

HEREDITARY SYPHILIS

Hereditary syphilis is syphilis transmitted to the fetus *in utero*. A healthy child born of a syphilitic mother may acquire syphilis at birth or soon after. As a matter of fact this often happens. Syphilis so contracted is acquired syphilis, and presents the usual manifestations of acquired syphilis. Syphilis which develops in the fetus *in utero* has essential differences from infantile acquired syphilis and should be sharply distinguished from it. In considering hereditary syphilis we are, of course, confining ourselves to syphilis contracted before birth.

CHARACTERISTICS OF HEREDITARY SYPHILIS

Excepting the initial lesion, hereditary syphilis may produce any manifestations of the acquired disease. It has skin lesions, lesions of the mucous membranes, and lesions of the deeper structures analogous to those produced by acquired syphilis. The clinical picture, however, varies very much from that of acquired syphilis. As a rule, the lesions on the surface of the body are exaggerated in type compared with the symptoms of acquired syphilis during its acute course. The deeper structures of the body are much more extensively involved, and the disturbance of the general health of much graver character. Because of its attack during the development of the fetus some of its common symptoms are lacking in acquired syphilis, and it produces deformities and dystrophies that are necessarily lacking from syphilis which invades the body after growth has been attained.

Hereditary syphilis may become active during the development of the fetus, or its first manifestations may appear at varying times after birth. As a rule its severity varies inversely with the age of the patient. The earlier it attacks the fetus or the child, the graver its course.

SYPHILIS AND ABORTION

When the fetus is infected very early in its development, or at any time before the third or fourth month, the death of the fetus from syphilis is very likely to occur, and a miscarriage to take place at from the third or fourth, to the seventh or eighth month. It results, therefore, that syphilis is one of the great causes of the miscarriages of dead fetuses.

Time of Appearance of Hereditary Syphilis.—If the attack is not so intense as to cause the death of the child, it may be born with syphilis active at the time of birth. Much more frequently the child is born apparently healthy and the disease appears three or four weeks after birth. It rarely appears later than six months. In a few rare cases, however, the intensity of the infection is so slight, or the resistance of the child to the infection so great, that its manifestations only appear several years after birth.

The strong tendency of hereditary syphilis to appear early is indicated in the accompanying tables of Still and of Diday:

DATE OF FIRST APPEARANCE OF SYMPTOMS

	Still No. of Cases	Diday No. of Cases
In first month	54	86
In second month	26	45
In third month	16	15
Between third and sixth month	3	9
Between sixth and twelfth month	3	2
Before 2 years	2	1
	104	158

Thus in the experiences of Still and of Diday symptoms appear before the second month in over 50 per cent. of the cases; before the third month in 75 per cent.; before the fourth month in 90 per cent., and before the seventh month in from 95 per cent. to 98 per cent.

Symptoms and Course.—In the cases of children born with the active disease the manifestations are usually of extreme type. The skin and mucous membranes are extensively involved in the syphilitic eruption. Severe rhinitis and laryngitis occur. The child has a purulent nasal discharge; it snuffles, and on account of the nasal

obstruction, breathes and nurses with difficulty. On account of the laryngitis it has a characteristic high-pitched harsh cry. The spleen is usually, and the liver often, enlarged and there is evidence of grave systemic disturbances. The child is emaciated and cachectic. The skin is sallow and falls in wrinkles over the thin limbs and body, and the face has a pathetic anxious old-man appearance. The gravity of the systemic symptoms rapidly increases, and the cases usually terminate fatally within a few days to a few weeks.

If the child is born infected, but without active evidence of the disease, it is usually to all appearances healthy and normal, and nothing ominous develops immediately. In the course, however, of from two to six weeks, rarely longer, the disease appears. Its appearance may be preceded for a few days by restlessness and deterioration of the general health, but the first indication of the disease may be the appearance of snuffles and the development of a characteristic harsh cry. The symptoms are similar to those previously outlined, but vary in degree from cases that run a rapid, fatal course, to those showing a moderate severity of the disease. The fatality among these cases is still very high, but if they are vigorously treated, and otherwise well cared for, a good many of them survive .

LATE RESULTS OF HEREDITARY SYPHILIS

Some children which survive early congenital syphilis may later show very little traces of the disease. Usually, however, they are far below normal. During infancy their nutrition is poor; they do not gain rapidly; they begin to walk late; and they are small, wizened, and old looking. Damage to the nervous system is common, but if absent, the mental development is not below normal. At the period of second dentition, or at puberty, further evidences of perverted nutrition are apt to appear. Their growth is retarded and infantilism may persist. They present characteristic deformities and dystrophies that indicate the lack of normal development of their bodies.

Bones.—Affections of the bones are among the most frequent manifestations of hereditary syphilis and among the earliest to appear. They may be due either to developmental defects of the bones, or to the actual presence of syphilitic lesions. In the early course of

hereditary syphilis one of the most constant symptoms is a thickening of the long bones accompanied by disease of the epiphyses. The skull is frequently somewhat distorted and exaggeration of the prominences on either side of the forehead in early hereditary syphilis is one of the characteristic symptoms. Another equally characteristic symptom which has its origin in fetal disturbance is a slight bending forward of the shin-bones, producing so-called saber-shins. Gummas in the bones are common. They occur most frequently in the bones of the face, particularly of the nose, and of the fingers, and may produce characteristic and, in the face, very disfiguring deformities. Because of their frequency and prominence the bony deformities and distortions caused by hereditary syphilis are among its most characteristic manifestations.

Heart and Blood Vessels.—The manifestations of hereditary syphilis of the vascular system are not the frequent complications that they are in acquired syphilis. Affections of the heart, due to congenital syphilis, are not often observed. Syphilis of the blood vessels of the brain and of other viscera is occasionally observed, but arteriosclerosis is not, as might be expected, a common result of hereditary syphilis.

Affections of the Eye and Ear.—Eye and ear affections in hereditary syphilitics form one of the most important groups of complications of the disease, both medically and socially. Inflammatory changes in the optic nerve have been demonstrated by Beck and Mohr in children from 8 days to 3 years old in about 50 per cent. of the cases examined, and other authors give figures as high as 75 to 82 per cent. This early involvement is evidently transitory, since only a small percentage develop grave symptoms or lose their sight entirely from this cause.

A second common and serious manifestation of syphilis in the eye and one which is to a high degree characteristic of the hereditary form of the disease, is an inflammation of the cornea known as interstitial keratitis. Derby has estimated that about 1 in every 180 eye cases in a large dispensary is a case of interstitial keratitis. The condition is rebellious to treatment, and especially so under the unfavorable conditions of home management. The gradual clouding of the cornea

effects a most serious impairment of vision in neglected cases, and may easily result in complete loss of vision. Iglesheimer from a study of 152 eyes with interstitial keratitis found that only 60 per cent. recovered useful vision, and 40 per cent. were disabled partially or completely. Of 71 cases investigated the earning capacity was unchanged in 28, while 43 suffered varying diminution. The seriousness of such a condition from the social standpoint is apparent. Relapses are prone to occur, and the complication is one that tends to develop late, usually from the fifth to the tenth year. It may not appear until from the eighteenth to the twenty-fifth year, as, for example, in women after the birth of a child or at some other period of lowered resistance.

Ear.—The principal form of ear disease attributable to hereditary syphilis is internal-ear deafness, due to obscure changes in the auditory nerve. Defects in hearing are often not recognized until the child fails to learn to talk. On the other hand the hearing may seem normal for some years, and then the child becomes abruptly or gradually deaf without apparent cause, or in association with some trifling disturbance. The deafness may be total or partial, the patient still being able to recognize notes of a certain pitch. Deafness of the syphilitic type occurring under the age of 10 nearly always results in more or less complete deaf-mutism unless special training can be carried out. Syphilitic deaf mutes may also suffer from interstitial keratitis, which makes their lot a peculiarly unfortunate one. Hereditary as well as acquired syphilis is subject also to other disturbances of the auditory nerve, which however, do not especially affect the sense of hearing.

Nervous System.—Syphilitic children may entirely escape damage to the nervous system. In such cases, although the children may show distinct stigmata of syphilis, the mental development is not likely to be below normal; indeed, they sometimes show a good deal of precocity. In not a small number of congenital syphilitics, however, serious involvement of the nervous system occurs. Syphilitic processes in the brain and spinal cord and their membranes occur in a considerable proportion of cases, and leave in their train serious permanent damage to the nervous system. Among these results of syphilis must be

included some of the cases of hydrocephalus and epilepsy, and some of the paralyses occurring in infancy and childhood. With relative infrequency tabes and paresis occur in children as a result of hereditary syphilis.

The worst result of hereditary syphilis of the nervous system is idiocy, which is sometimes one of its manifestations. Still, of London, found in his series of cases of hereditary syphilis that 10 per cent. showed cerebral affections of one kind or another. In 148 consecutive cases of congenital syphilis he found 6 congenital idiots and 4 cases of mental degeneration in later childhood; or almost 7 per cent. of mental defects among syphilitic children. In his opinion parental syphilis may be responsible for congenital idiocy without other evidence of the disease in the child. Most statistics run much lower than Still's. Shuttleworth and Beach, in their statistics from an idiot asylum found 1.17 per cent. of the idiocy due to syphilis. Telford Smith found about the same proportion among 580 cases of idiocy. Tredgold found a maximum of 3 per cent. in 150 cases. As these statistics were made before the day of the Wassermann test they probably fail to reveal the total number of syphilitic cases, and show that syphilis is responsible for a considerable proportion of idiocy, perhaps 5 per cent.

Dean recently among 330 idiots found 15.5 per cent. with positive Wassermanns. Of these only 7, however, showed clinical evidence of hereditary syphilis. The symptoms in the cases included epileptiform convulsions, chorea, strabismus, nystagmus, hemiplegia, spastic diplegia, deafmutism and aphasia. As Dean's findings indicate, all cases of idiocy with congenital syphilis are not essentially syphilitic in themselves. Syphilis is one of the very common accidents among the mentally weak and defective, who are likely, quite independent of the transmission of syphilis to their offspring, to transmit to them psychopathic tendencies which result in a considerable number of idiots.

TARDY HEREDITARY SYPHILIS

In a certain proportion of children born with hereditary syphilis, either on account of their natural resistance to the disease or for some other reason, its presence is entirely masked during early childhood, and they develop to the eighth, tenth or even fifteenth year before the

disease makes its initial appearance. For the establishment of the occurrence of these cases of tardy hereditary syphilis — *syphilis hereditaria tarda*—and for our knowledge of their clinical course, we are indebted to Hutchinson and Fournier.

This form of syphilis manifests itself chiefly in the eyes, teeth, joints and nervous system. While it may manifest itself in the form of the usual gummatous processes, its commonest manifestations are in the form of dystrophies, and the most characteristic of these occur in the teeth and eyes. In the eyes it causes a chronic inflammation of the cornea, and in the teeth it produces a peculiar development of the incisors. For the recognition of both of these peculiar late manifestations of syphilis we are indebted to Jonathan Hutchinson. The chronic inflammation of the cornea, or keratitis, has been referred to in connection with syphilis of the eyes.

The first teeth of hereditary syphilitics sometimes show defects of development, but this is by no means common, and the characteristic failure of development in the teeth, known as Hutchinson's teeth, occurs in the permanent teeth. It is most marked in the central upper incisors. The teeth stand apart, are peg-shaped, smaller than normal, with a crescentic notch in the cutting edge which extends on to the front surface of the tooth. The combination of Hutchinson's teeth, keratitis, and deafness from middle-ear disease, known as Hutchinson's triad, is the most characteristic picture of hereditary syphilis. Fortunately it is not a very common one.

HOW LATE CAN HEREDITARY SYPHILIS FIRST MANIFEST ITSELF?

Tardy hereditary syphilis, in the great majority of cases, appears before puberty. Occasional cases have been recorded in which the first manifestations of hereditary syphilis occurred as late as the twentieth, or even the thirtieth year. These very late cases of the first manifestations of hereditary syphilis are open to many sources of error. Earlier manifestations may have been overlooked. Many of the cases recorded as of hereditary syphilis are undoubtedly acquired syphilis, and it is exceedingly difficult to eliminate the possibility of syphilis acquired at birth as a source of error in many of these supposed late first manifestations of hereditary syphilis. Even most of the subjects

of the manifestations of tardy hereditary syphilis usually show earlier some of the stigmata of the disease. A normal healthy child is, I believe, exceedingly unlikely to develop so late as puberty any manifestations of tardy hereditary syphilis. Those who have some of the developmental defects of hereditary syphilis may present tardy manifestations of the disease at 20 or even later, but even in such patients as these the appearance of tardy manifestations after the twentieth year is a clinical curiosity.

Hereditary syphilis, in fact, has a much more definite tendency to spontaneous recovery than acquired syphilis. This is shown especially by two facts. First, the occasional reinfection with syphilis of a patient who has had hereditary syphilis; and secondly, the failure of hereditary syphilis to be transmitted to the third generation.

REINFECTION OF HEREDO-SYPHILITICS

For a patient to be infected with syphilis means that any previous infection must have disappeared. Both clinical experience, and recent experimental studies of syphilis indicate that reinfection is not possible unless the patient is free from syphilis. But it is possible after he is free; for immunity to syphilis ceases with the disappearance of the disease. A reinfection with syphilis, therefore, is the best possible evidence that a patient who has previously had syphilis has been cured of it. Until the recent introduction of the most thorough methods of treatment, reinfection of acquired syphilis was so rare that its occurrence has been questioned. On the other hand, the reinfection of patients who have had hereditary syphilis has been many times observed.

THE CONDITION OF NON-SYPHILITIC CHILDREN OF SYPHILITIC PARENTS

There is a common impression that the children of syphilitic parents, even if they escape the disease, are apt to be physically or mentally unfit, and likely to show anomalies or defects of development. This view arises from the failure to recognize that syphilitic dystrophies occur, not in the syphilis-free children of syphilitic parents, but solely as a result of the manifestations of actual hereditary syphilis. Syphilitic parents may bear healthy children. They are free from any

direct or indirect evidence of syphilis. They are Wassermann negative. Above all, their entire freedom from syphilis is shown by the fact, many times observed, that they are not immune to syphilis, but may even in infancy contract the disease. Long experience shows that the children of syphilitic parents, if they escape the disease, escape it entirely. They inherit the normal characteristics of their parents, and they show no especial unfitness for life.

PROGNOSIS OF HEREDITARY SYPHILIS

In spite of the fact that a proportion of hereditary syphilitics live to escape the ravages of the disease and that in some its symptoms are so mild as to leave no evident traces, hereditary syphilis is one of the gravest of diseases. Children born with active manifestations of the disease as a rule die in from a few days to a few weeks. Among those in whom the symptoms appear in the first six months many of the cases can be saved by intelligent care, but among these the mortality is still high. Engel and Reimer found that of children showing symptoms in the first four weeks of life nearly all die; of those showing them in the second month, two-thirds die; in the third month, about one-half die; and that only about 28 per cent. of hereditary syphilitic children survive the first year.

A mortality of 75 per cent. during the first year among syphilitic infants is a common estimate. I think this is not exaggerated for institutions. If the children are ursed by the mothers and given vigorous treatment and proper care the mortality is very much less. Etienne puts the mortality of untreated syphilitic children as high as 95 per cent.; but of those properly cared for, only 10 per cent.

Still found the following situation in the families of 87 children who were under treatment for congenital syphilis: In these families there had been 39 still-births; 36 miscarriages, and 25 deaths, all attributable to congenital syphilis, and of these 87 children under treatment 13 died while under observation. "In other words, out of 187 born or unborn, 113 were sacrificed through the syphilis of their parents." Nor is the sacrifice through death the only sacrifice of hereditary syphilis, for of the 25 or 30 per cent. showing syphilis during the first year of life who survive, most of those are relegated by the disease to the class of the unfit.

ETIOLOGY OF HEREDITARY SYPHILIS

It is impossible to arrive at any definite estimate of the prevalence of hereditary syphilis. The disease is so fatal that most cases disappear, and among children more than 2 years old the number of cases of hereditary syphilis is very small. Vas found among 106,407 child patients in the children's clinic at Budapest from 1905 to 1909, 720 who had congenital syphilis; that is, one child in 148 was syphilitic, about 0.66 per cent.

MODE OF TRANSMISSION

The mode of transmission of hereditary syphilis has long been a matter of discussion. Until recently it has been held that it was possible that syphilis might be transmitted to the ovum by the father without the mother contracting syphilis. That this is theoretically possible is indicated by the fact that spirochetes have been found in the semen, and that in a very few animal experiments inoculation with semen has been successful. That it is practically impossible is shown by the fact that for such successful experimental transmission of syphilis a large number of spirochetes is necessary, while the number that could reach the ovum directly through the semen is infinitesimal. Researches in other directions have shown that every mother of a syphilitic child is herself syphilitic.

It has long been known that the mothers of syphilitic children could not be infected with syphilis by those children. So universal is this phenomenon that since 1837 it has been known as Colles' Law. We know now that immunity to infection with syphilis means that the individual has syphilis; and Colles' law expressed in modern phraseology simply amounts to a statement that every mother of a child showing hereditary syphilis is syphilitic. The findings of the Wassermann indicate the same fact. The Wassermann reaction of the mothers of syphilitic children, is, at the time of the birth of such children, positive in as large a percentage of cases as it is in patients who are manifestly syphilitic. That hereditary syphilis is solely transmitted through maternal infection there is no longer room for doubt.

It is nevertheless true that many mothers of syphilitic children show aside from the Wassermann and their immunity to syphilis, no evidence

whatever of syphilitic infection, and are unconscious of its existence in themselves. This is explainable in part by the mild course that syphilis frequently runs, particularly in women, in whom its manifestations are often so mild that they entirely escape observation. It may also be due to the fact, as suggested by Hoffmann, that the natural resistance of these mothers is greatly fortified by the presence in the maternal circulation of antibodies produced by the fetal tissues in response to the presence of the great number of spirochetes in them, and that as a result of this the manifestations of the disease are completely masked.

TIME OF INFECTION OF FETUS

Infection of the fetus may take place at any time during pregnancy. It usually occurs within the first five months of fetal life. It rarely occurs after the seventh month. The later in fetal life syphilis is contracted the less opportunity there is for damage from the infection, and the greater is the likelihood of escape from the severe manifestations of the disease. When the mother is actively syphilitic at the time of conception, or when she acquires the disease during the first five months of pregnancy, there is little chance of the child naturally escaping syphilis. This chance, however, is materially increased by vigorous treatment of the mother. If syphilis is contracted by the mother as late as the seventh month of pregnancy, the chance is good, particularly if the mother is vigorously treated, that hereditary syphilis may be escaped.

DURATION OF INFECTION PERIOD IN THE MOTHER

For the mother to transmit syphilis she must have active syphilis. For the disease to be transmitted to the fetus spirochetes must be present in the mother's blood, and in sufficient numbers to produce infection. This is commonly not the case when syphilis has reached the stage of isolated tertiary lesions. It results, therefore, that hereditary syphilis is only commonly transmitted during the first years of maternal syphilis. After the second year it is rare, but during periods of recurrent activity a mother may become again infectious, so that syphilis may again be transmitted to her offspring. It happens therefore, occasionally that a woman will bear a syphilitic child; will then

bear a healthy child, and subsequently, may again bear an infected child. Cases occur in which women bear syphilitic children from six to twelve years after infection. These cases are, however, the uncommon exception. The usual course when hereditary syphilis is transmitted is that the mother has, first, miscarriages of syphilitic fetuses; then perhaps bears a syphilitic child, and later on, perhaps, bears children free from the disease. It is not uncommon for women who have active manifestations of tertiary syphilis to bear healthy children.

THE TRANSMISSION OF SYPHILIS TO THE THIRD GENERATION

For manifest reasons it has been expected that syphilis might be transmitted to the third generation, and possibly further, and from the earliest days of syphilis this question has been one of constant interest and observation. Theoretically, of course, the transmission to the third generation is a possibility. Equally possible, theoretically, is it that if syphilis can be transmitted to the third generation, it can be transmitted to the fourth, and so on. As a matter of fact, however, transmission to the third generation is still an undetermined possibility. Authorities of such wide experience and acute observation as Fournier and Hutchinson disagree on this subject. Fournier has produced a number of cases in which he thinks transmission to the third generation is probably established. Hutchinson, with his enormous experience, at one time believed it possible, but in the end was unable to find any case within his experience so free from the possibility of error in the facts as to convince him of its occurrence. R. W. Taylor may be cited also as an authority who, after giving life-long attention to the subject, was in the end a disbeliever in its occurrence. In view of the alertness with which the transmission to the third generation has been watched for, and the extreme rarity of even plausible cases supporting the fact, it must be said that if it ever occurs, it occurs with unexampled rarity; such rarity as to make it entirely negligible.

THE MARRIAGE OF HEREDITARY SYPHILITICS

The failure of hereditary syphilis to be transmitted to the third generation indicates that having had hereditary syphilis is not in itself

a bar to marriage. Patients who have distinct stigmata of hereditary syphilis often belong to the class of the physically unfit, and as such, from the standpoint of society, are not suitable persons to bear children; but this is on account of their general physical defectiveness, and not because they are likely to transmit syphilis.

CHAPTER VIII

THE PATHOLOGY OF SYPHILIS

THE DIFFUSION OF THE SPIROCHAETA PALLIDA THROUGH THE BODY IN THE COURSE OF SYPHILIS

It was formerly believed that the virus of syphilis did not begin to grow immediately after inoculation, and it is true that the early proliferation of spirochetes at the site of the chancre is relatively slow compared with their luxuriant growth after they have become fully established. Nevertheless, Neisser's experiments have shown that the growth and spread of the spirochetes is so rapid that excision of the site of inoculation twelve hours after infection does not prevent the development of systemic syphilis. The first growth of the spirochetes is in the mucous layer of the epidermis, and in the lymphatic spaces and capillary walls of the corium. Here they multiply until they cause sufficient irritation to produce the chancre. In the meantime they spread along adjacent lymphatics, and in the perilymphatic tissues. During the earlier days of the chancre the spread of the disease is chiefly along the lymphatics, and for the primary spread of syphilis the lymphatic system is chiefly responsible.

There can be little doubt that in the end the general diffusion of the spirochetes over the body is largely by means of the blood stream. Spirochetes have been found in the blood before the Wassermann becomes positive—that is, within ten days of the existence of the chancre—and in animals they have been found in the blood five days after the appearance of the chancre. The rapid diffusion of spirochetes at the beginning of the secondary stage—at the time of the sudden appearance of the eruption—represents a sudden shower of spirochetes which could only occur through the blood stream. Nevertheless, the blood is not a favorable medium for the growth of the spirochetes, and the demonstration of them in the blood, even in the most florid stage of secondary syphilis, is difficult. Even during the early active

stage of secondary syphilis the disease is hardly to be regarded as a spirochetal septicemia, but rather as a condition in which the blood acts as a passive carrier for the infective agent, the objective manifestations of the disease being due to the local reaction excited by spirochetes at the various sites on which they find lodgment and succeed in growing.

As Uhlenhuth and Mulzer have shown, the period of general diffusion of spirochetes through the blood is of only a few weeks duration, and, corresponding to the disappearance of the spirochetes in the blood, is the diminution of their number in the secondary lesions of syphilis. After the general diffusion of the disease, and the development of syphilitic lesions throughout the body, there is a building up of resistance to the disease that checks the luxuriant growth of the spirochetes and in time gets the upper hand of them to the point that their number instead of increasing is rapidly reduced. Most of the foci of spirochetes are destroyed, and the further growth of them limited to isolated colonies. We see the evidence of this in the subsidence of symptoms and in the rapid diminution and disappearance of spirochetes from lesions previously showing them in abundance. Long before the end of the secondary period their presence is restricted to tissues in which they are best able to maintain themselves, or to foci of infection which are inaccessible to the attack of the body defenses or of remedies. It is to the persistence of some of these foci of infection that tertiary manifestations of syphilis are due.

REASONS FOR THE IMPORTANCE OF EARLY TREATMENT

A little consideration of this progress of the *Spirochaeta pallida* through the body indicates the reason for the importance of the early specific treatment of syphilis. It is evident that if the spirochetes are to be completely destroyed in the body by treatment, the chances of success are greatest in the early course of the disease. The best opportunity is in the first week of the chancre before the Wassermann becomes positive, and while the spirochetes are relatively localized. By the time they have become diffused throughout the body, as indicated by the appearance of the eruption, the possibility of completely destroying them has been greatly reduced. After they have become established in isolated, well-protected foci, the prospect of completely

destroying them is made still more difficult. There is only one factor in the destruction of the disease which becomes more favorable after the disease becomes generalized, and that is that this generalization calls out a maximum of the body defenses to resist the organism; and the great number of benign cases of syphilis indicate how important the natural defenses of the body are in the battle against this infection.

THE SPIROCHAETA PALLIDA IN RELATION TO THE LESIONS OF SYPHILIS

All experience since the announcement of Schaudinn and Hoffmann's discovery has confirmed the fact that every lesion of syphilis is due to the presence of the *Spirochaeta pallida.* It has been demonstrated now in practically every lesion of the disease. Inoculation experiments have shown that the number of spirochetes present in any given lesion determine the relative infectivity of that lesion. The quantity of material necessary, therefore, to produce infection is a fair measure of the number of spirochetes in the material, and by using this method in animal experiments there has been obtained much of the information which we have in regard to the presence of spirochetes in the different tissues of the body.

Spirochetes in the Chancre.—The chancre at its appearance, and for a week or more afterwards, shows a great abundance of spirochetes. After the first week they begin to decrease, and before the disappearance of the chancre they are demonstrated with difficulty. They may, however, be found at times in the scar following the chancre; and renewal of the activity of residual spirochetes at this site may cause the development later of a new lesion closely resembling a chancre. This recurrence at the site of the chancre is the explanation of many supposed cases of reinfection. After the appearance of the secondary stage, they have a wide distribution throughout the body, and are present in many of the tissues.

If all tissues of the body were equally favorable for the growth of the *Spirochaeta pallida* their diffusion through the blood stream would produce active manifestations of syphilis in all of the tissues of the body. As a matter of fact, the tissues vary greatly in their susceptibility to the invasion of this organism.

Tissues Most Susceptible to the Spirochetes.—While, perhaps, no tissue is immune to the manifestations of syphilis, yet the clinical symptoms and experimental study of syphilis show that the chief susceptibility to the attack of the *Spirochaeta pallida* lies in a few tissues. First among these come the skin and mucous membranes; next, the blood vessels; next, certain structures of the central nervous system; and then the bones and periosteum. This relative susceptibility of tissues as shown by the manifestations of secondary syphilis, are of great interest, because the same susceptibility persists in later syphilis, and the manifestations of tertiary syphilis occur with the same relative frequency in these same structures.

Secondary Syphilis of Internal Organs.—Unfortunately, our knowledge of secondary syphilis of the internal organs is limited, and not much light has been thrown on it by the study of animal syphilis. That the blood vessels and the heart and central nervous system are frequently invaded in secondary syphilis, we have abundant evidence, but of the activities of secondary syphilis in most of the other internal structures we have little appreciable manifestation. The most contagious internal structures in secondary syphilis are the liver, spleen, bone-marrow, ovary, and testis, and the occurrence of late lesions of syphilis in these structures indicates that secondary lesions occur in them. But the involvement of these structures in late syphilis is relatively so infrequent in comparison with that of the skin, nervous system and bones, that it indicates that secondary lesions of these structures are at least temporary and unimportant in most cases. Certain other structures, among them the lungs, the kidneys and muscles, give no evidence by inoculation experiments of the presence of spirochetes in them during the most active period of the disease.

Spirochetes in Tertiary Lesions.—In tertiary lesions the number of spirochetes is so few that their demonstration is attended with great difficulty, and they are only to be found in the active growing part of gummas. The necrotic center of gummas contains no spirochetes. The absence of spirochetes from the discharge of gummatous ulcers and their sparsity in the tissue of gummas, correspond with our clinical experience of the non-infectivity of these lesions. Their infectivity is so slight as to be practically nil, although, under the conditions of

animal experimentation, it has been shown that they are theoretically infectious. The last word in the pathogenicity of the *Spirochaeta pallida* for all syphilitic lesions was said in the demonstration by Noguchi of the *Spirochaeta pallida* in tabes and paresis.

Spirochetes in Hereditary Syphilis.—In hereditary syphilis the *Spirochaeta*nstrated in practically every lesion, *pallida* has been demo and in early fatal cases the number of them demonstrable in certain tissues, like the liver, is amazing. Not only are they found in the more susceptible structures such as the skin, the liver, the spleen, and the testes, but in the lungs, the suprarenal and thyroid glands, the eyes, the brain and cord, the kidneys, stomach, intestines, muscles, heart and bones. Their great number in the viscera in congenital syphilis comports with the very serious constitutional systemic manifestations of most cases of hereditary syphilis. To quote McIntosh and Fildes:

> The disease in many of these infants can only be described as an acute invasion of the entire system. One can therefore readily understand that an early intra-uterine infection frequently causes the death of the fetus. It is remarkable that children so severely infected at birth ever survive.

From the foregoing it is easily understandable that the early active lesions of hereditary syphilis are extremely infectious.

HISTOLOGY (MICROSCOPIC ANATOMY) OF SYPHILITIC LESIONS

The syphilitic lesion is histologically a granuloma; a mass of granulation tissue, such as is produced by numerous infectious agents which elaborate mildly irritating toxins that cause a correspondingly slow reaction in the tissues. While in secondary syphilis the syphilitic lesion may include all of the elements of acute inflammation, it is composed chiefly of lymphocytes, endothelial cells and fibroblasts—of the fixed connective-tissue cells. The syphilitic granuloma is characterized by its highly vascular structure, by the extreme involvement of the blood vessels in the process, and by the intrinsically low vitality of the granulation tissue. Unlike ordinary granulation tissue, it is unable to become organized into healthy scar tissue. It either undergoes degeneration or necrosis, and, except possibly in lesions of the most delicate character, is replaced by scar tissue. It is impossible to say how far the tendency to degeneration and necrosis in gummas is due to the

involvement of the blood vessels in the syphilitic process and the consequent interference with the blood supply. This damage to the blood supply is at least the most important factor in the instability of gummas.

A syphilitic infiltration may be absorbed when small, with inappreciable alteration in the tissues in which it was situated; or it may result in distinct scar-tissue formation at the site of the lesion; or it may undergo necrosis and sloughing with the destruction of the tissues in which it occurred and their subsequent replacement by scar tissue. With the more delicate lesions of secondary syphilis the course is usually either one or the other of the first two outlined above. Most secondary syphilitic lesions cause little or only microscopic scarring. In the severe pustular secondary syphilitic lesions there may be necrosis followed by ulceration and scarring, such as occur in smallpox. In tertiary syphilis the gummas undergo caseation or necrosis, and because of their larger size, result in gross destruction of tissues, with the formation of macroscopic, and often extensive, scars.

CHAPTER IX

THE PROGNOSIS OF SYPHILIS

The prognosis of syphilis is good as respects the benign course of most well-treated cases. In view of the fact of the general dread of the disease, and the popular impression that once syphilitic, always syphilitic, this broad fact should be emphasized. Most cases of syphilis under proper conditions pursue a benign course, disappear, and leave the patient free in after-life from any evidence of the disease. On this subject it may be well to quote the foremost English speaking clinician, Osler, who says in 1914, writing with Churchman:

> Syphilis is a curable disease. It is not, however, *always* cured even by the most efficient treatment; and there is unfortunately no way of determining with exactness whether treatment in a given case has been sufficient to warrant us in a dogmatically favorable prognosis. We have only empirical results to go upon; but the clinical records of large series of cases carefully studied over long periods of years, justify the following conclusions as to the outlook for a luetic patient: (1) In general, the prognosis for the average case is good with careful treatment, and bad without it. . . .

The weak point in the prognosis of syphilis is that in a percentage of the cases, relatively small though it be, serious after-consequences of syphilis occur, and we have no way by which we can give absolute assurance that in any given case these consequences will be escaped. The most we can do is to assure the patient that by pursuing a given course the possibility of these consequences will be reduced to a minimum. This assurance with our present knowledge of syphilis we are justified in giving.

Effect of Physical Resistance on Prognosis.—In our attempts to cure syphilis, or to minimize the future dangers of the disease, we have two sorts of therapeutic means at our command: First, the utilization of all of the body's natural means of combating the disease; and second, the use of artificial curative agents.

In the first category is included the maintenance of the body resistance of the individual at the highest point. All clinical experience supports the obvious conclusion that the natural defenses of the body furnish a powerful means in most cases for combating the attack of syphilis. The ideal patient to resist syphilis is the individual of sound body and of good physical inheritance who lives a rational life under proper hygienic conditions. Natural resistance to syphilis unquestionably varies among apparently normal men. Occasionally a vigorous normal individual shows undue susceptibility to the syphilitic infection. But this is exceedingly rare, and, as a rule with few exceptions, the healthy individual shows least the effects of syphilis.

The effect on the course of syphilis of a rational mode of life is of the utmost importance. The man of sense, who leads a reasonable life free from excesses and who has the will to carry through his course of treatment, is the one for whom the troubles and dangers of syphilis are least. On the course of syphilis, perhaps as much as on that of any other disease, are shown the unfavorable effects of bad modes and unfavorable conditions of living. To offer an extreme illustration, the patients in whom we see the most serious manifestations of secondary syphilis, and nearly all of the most serious manifestations of tertiary syphilis except tabes and paresis, are dissipated vagabonds — the wretches in whom dirt and exposure, and poor food and dissipation have reduced tissue resistance to its lowest degree. Coming higher in the social scale, another illustration of the unfavorable subject for syphilis is the reckless man-about-town; without domestic obligations or without sense of responsibility for them, who burns the candle at both ends and who has not the intelligence and the will to follow reasonable instructions about the conduct of his life or to accept the slight inconveniences of thorough treatment. About the time he reaches 45 to 55 syphilis nearly always gets him—in the arteries, or in the nervous system, or in the liver, or in some other vital structure.

EFFECTS OF HABITS ON PROGNOSIS

Alcoholism.—The increased tax on the body of alcoholism without other dissipation is sufficient to damage, to a great extent, the prospect of the syphilitic. Alcoholic patients, if they will attend to treatment,

usually weather secondary syphilis well, but the habitual moderate use of alcohol—in the sense in which the habitual drinker uses the word moderate—is an important predisposing cause of the arterial changes and the late nervous lesions which syphilis is prone to produce. On account of these alone alcoholism greatly diminishes the prospect of life of the syphilitic.

Tobacco.—The use of tobacco renders considerably more difficult the management of secondary syphilis, and it tends by its irritation to produce syphilitic manifestations in the mouth throughout the course of the disease. In rare cases it is the predisposing factor in determining the appearance of cancer in the mouth which develops in mouth lesions that are themselves the result of syphilis. But except for its influence on the mouth, tobacco cannot be severely arraigned as affecting the prognosis of syphilis.

Overstrain.—Coming to innocent excesses, the effects of overwork, of anxiety and worry, and of undue mental and physical strains of all sorts on the course of syphilis are presumably unfavorable. As a matter of safety, the individual with syphilis should avoid these excesses as far as possible during its active period. He should husband his resistance to the utmost in order to combat the disease during its period of systemic activity. The relative infrequency of serious syphilis of the nervous system among primitive people justifies the assumption that the late serious manifestations of nervous syphilis occur most frequently among men who endure the stress of an intense life. And experience shows that habitual mental and physical overstrain and pressure damage the prospect of life of the syphilitic, but whether they do this in greater degree than they do for the non-syphilitic is open to possible question.

EFFECT OF OTHER DISEASES ON THE COURSE OF SYPHILIS

The individual who is already reduced by some other disease of course has his burden increased by infection with syphilis. This may act by rendering his syphilis worse. So far as my own experience goes, however, the ability of patients with other chronic diseases to withstand syphilis has not been greatly diminished by the existence of such diseases. The unfavorable influence is much more likely to be exerted by the syphilis on the other disease.

The engrafting of syphilis on pulmonary tuberculosis is particularly supposed to be an unfavorable combination. So far as my limited personal experience has gone, this is not true. The slight cachexia of early syphilis exerts doubtless an effect on tuberculosis, but, as I have seen the combination in patients with pulmonary tuberculosis, the effect of the syphilis on the tuberculosis has been inappreciable.

In diseases of the viscera the addition of syphilis may well be a serious complication. Syphilis is likely to light on the point of least resistance, and when damaged structures already exist it is very easy for a focus of syphilitic infection to start up in these structures, and greatly increase the damage. When the point of least resistance in individuals is the nervous system, the prognosis of syphilis is made appreciably worse. It is on these structures that syphilis produces its worst late effects, and it is desirable that the syphilitic patient should be free from any inherent weaknesses in them. On diseases of the kidneys in particular the effect of secondary syphilis is supposed to be bad. The elimination of the toxins of syphilis throws an increased burden on the kidneys. This in itself sometimes produces a nephritis, which, however, is usually temporary and not serious. The increased burden thrown on the kidneys by syphilis may at times greatly embarrass already damaged kidneys. As a practical fact, however, patients with damaged kidneys are usually able to pass through secondary syphilis without exaggeration of the syphilitic symptoms and with little or no effect on the course of the kidney disease.

EFFECT OF TREATMENT ON PROGNOSIS

Syphilis is one of the few diseases in which the artificial factor of specific medication may claim to exert a greater influence on the course of the disease than that exerted by the natural curative forces of the body. In recent years a number of important specific remedies for various diseases have been produced; remedies which act directly by destroying the virus in the body, or neutralizing its effect. Of these diphtheria antitoxin is the most important. Until these recent advancements in medicine there were only two notable specific remedies. These were quinin for malaria, and mercury for syphilis. Their very definite specific action on the respective diseases has furnished the greatest

stimulus that has existed for an intelligent effort at the discovery of other specific therapeutic agents. Because of the specific action of mercury on syphilis it may be said that the treatment of syphilis is the most important factor in the prognosis of the disease.

All experience is at one in establishing this fact. The statistics of the syphilographers of the last half of the nineteenth century leave no doubt on the point, and the importance of treatment in influencing favorably the prognosis has probably been greatly increased by the development of the new methods of treatment which are founded on the introduction of salvarsan by Ehrlich in 1909. The discovery is too recent for experience yet to show that the newer methods of treatment reduce the contingent dangers of later syphilis, but *a priori* considerations indicate that this is true. Particularly do they indicate that it is true when treatment is begun early and thoroughly administered.

IMPORTANCE OF EARLY TREATMENT

It has long been recognized that the earlier treatment is begun after the diagnosis of syphilis is established, the better is the prognosis of the case. Recently discovered facts greatly increase the importance of early treatment. As has been pointed out, the diagnosis of syphilis can now be made by a demonstration of the specific spirochetes as soon as the chancre appears. After the appearance of the chancre there is a period of a week or ten days, which I ventured to call the golden opportunity in syphilis, during which the Wassermann reaction is negative and the disease has not become generally diffused.

Theoretic considerations suggest that this brief period is the time when there is the best prospect of absolutely destroying the infection; and practical experience has confirmed this supposition. If the treatment of syphilis is begun at this time and vigorously carried out without delay, the prospect is good that the disease can be aborted; that it can be quickly and radically cured. Not enough time has elapsed to establish the fact that the patients who are apparently cured by treatment at this time will never have any future manifestations of the disease. But it has been abundantly proved that these patients can be made free from the disease according to all criteria for determining its existence which we have, and the reasons are sound for believing that they are cured.

After this first short period the prospect for radical cure is not so certain, but with cases gotten even in the early secondary stage, after the eruption has appeared and the disease has manifestly become generalized, the prospect of cure is still good, with vigorous, intelligent treatment. These patients can be freed from all evidences of syphilis, including the positive Wassermann reaction.

The longer vigorous treatment is postponed, the greater the opportunity the spirochetes have to wall themselves off in inflammatory deposits and to find lodgment in location inaccessible to specific remedies, and the poorer becomes the prospect of cure. After syphilis has reached the tertiary stage, the prospect of the complete eradication of the spirochetes by specific treatment is practically gone. The patients may be freed from symptoms, but all vestiges of the infection cannot be destroyed.

NECESSITY FOR THOROUGH EARLY TREATMENT

The favorable prognosis, based on early treatment, predicates that the treatment should be vigorously and thoroughly carried out. If this cannot be done, there are good grounds for believing that the prognosis is better if the course of secondary syphilis is not interfered with until it has by its activity aroused all of the natural defenses of the body to the point where they can offer their greatest resistance to the infection. Put in other words, this means that ineffectual early attempts at treatment with salvarsan, while suppressing the early symptoms of the disease and interfering with the development of the natural resistance of the body, do not cure it, but leave the body unprotected by its natural defenses; with the result that the later secondary and tertiary manifestations are likely to be more serious, if not more frequent, than normal.

PROGNOSIS OF LATE SYPHILIS FROM THE COURSE OF EARLY SYPHILIS

As has already been indicated, the severity of the course of secondary syphilis does not in itself offer any means of estimating the dangers of its later manifestations. Serious tertiary syphilis may follow either severe or mild secondary syphilis. It is also true that nothing can be predicated from the initial lesion as to the severity of either secondary or tertiary manifestations of syphilis. The uncontaminated chancre is

a trivial sore. Destructive chancres are always due to secondary infection of some sort, and they are no more likely to be followed by severe syphilis than are simple ones.

Extragenital chancres: The location of the initial lesion of syphilis would hardly be expected to give any intimation of the future severity of the disease, but there is a common impression that extragenital chancres are most frequently followed by serious manifestations of syphilis. The only possible explanation for such an impression exists with lesions about the face. Ehrmann and Levaditi have shown that the *Spirochaeta pallida* can pass from the primary lesion up the nerve sheaths and it is possible that when the primary lesion exists about the head the spirochetes might, by passing along these tracks, reach the brain and increase the likelihood of syphilitic lesions of the central nervous system. As a matter of fact, in an experience covering many initial lesions about the face and head, I have never seen any evidence to confirm the belief that this is more than a hypothetic possibility. In general, I believe that there is no ground, either in reason or in practical experience, to justify the impression that extragenital chancres offer any worse prognosis than chancres of the genitals.

THE PROGNOSIS OF TERTIARY SYPHILIS

When syphilis manifests itself in the form of tabes and paresis the prognosis for cure is not good. These conditions are so resistant to specific syphilitic treatment that the doubt as to their syphilitic character has only been dispelled by the recent discovery of the actual presence of the *Spirochaeta pallida* in the involved tissues. The apparent reason for the intractability of tabes and paresis is that in these conditions the location of the spirochetes is in tissues which are not reached either by the natural curative substances produced by the body in syphilis or by the artificial remedies used in its treatment.

The prognosis for the cure of syphilis of the blood vessels is also not good, chiefly because the involvement of these structures is so insidious that symptoms are not produced until permanent damage has occurred. And any permanent damage to the more important blood vessels of the body is a serious occurrence as respects the longevity of the individual. Syphilis may occasionally produce insidious sclerotic

changes in important viscera, especially the liver, that are serious and not amenable to treatment when discovered.

PROGNOSIS OF GUMMATA

Aside from these very slowly progressing manifestations of tertiary syphilis, chiefly in the nervous and vascular systems, the prognosis for the cure of tertiary syphilis, if its manifestations are promptly discovered, is good. The lesions in the skin and bones illustrate this best. For their cure, the only requirements are that their character be discovered before they have produced destructive changes and that proper treatment be administered. There is no better example of the efficacy of medicine than is found in the prompt way in which gummas vanish under treatment with mercury and the iodids. This phenomenon was as definite and prompt under the old methods of treatment with mercury and the iodids alone as it is now when salvarsan is used in addition. Gummas may be said to yield universally to the long-known methods used in the treatment of syphilis.

The favorable prognosis for the cure of tertiary syphilis when it is promptly discovered applies to tertiary syphilis of the nervous system other than tabes and paresis. Gummas of the brain, syphilitic meningitis, and syphilitic infiltrations of the walls of the blood vessels of the brain yield, as a rule, to specific treatment. But in them it is excessively important that the treatment be instituted early, before appreciable damage has been done to the extremely delicate and vital tissues affected.

The danger in the prognosis of tertiary syphilis lies in the fact that the lesions may escape recognition, until gummas have formed and broken down with the destruction of the tissues in which they are situated. When this has happened there is no way in which the tissues themselves may be replaced. The only repair that can be made is by the formation of scar tissue, and this means, of course, a defect in the tissues, whose seriousness depends altogether on the extent of the syphilitic necrosis and the importance of the tissues involved. With gummas concealed deep in the body, the great difficulty in the past has been the uncertainty in establishing their syphilitic character by purely clinical means. This difficulty has been lessened very greatly by the introduction of the Wassermann reaction, and the prospect of curing these lesions has been correspondingly increased.

FREQUENCY OF TERTIARIES

The most difficult question to answer for the syphilitic patient is, what are his chances of developing tertiary lesions of the disease? Statistics on this point are unsatisfactory, because the percentage of recurrences is, in chief part, dependent on the thoroughness of the treatment of the disease during the secondary period. The older statistics would indicate that in public practice, chiefly in dispensaries where treatment cannot be effectively carried out and where the patients are of a class unfavorable for cure, the percentage of tertiary relapses approximates about 10 per cent. of the entire number of cases. Thus Grön, in over 40,000 cases of syphilis collected from various sources, found the occurrence of tertiary syphilis in 11.75 per cent.; Diday, at Lyons, 12 per cent.; Rollet, at Lyons, 5 per cent. among well-treated private cases, and 15 per cent. among hospital cases; Audry, at Toulouse, 16.8 per cent.; Mathes, at Jena, 19.4 per cent.; Haslund, at Copenhagen, 12.4 per cent.; Neumann and Vajda, at Vienna, 6.82 per cent.; Marschalko, at Breslau, 7.4 per cent.; Raff, at Breslau, 9 per cent.; Ehlers at Copenhagen, 12.4 to 22 per cent.

These statistics all belong to a period when treatment was not carried out as thoroughly as it is now, so that the familiar tertiary lesions doubtless were more common than at present; on the other hand they take no account of some tertiary manifestations of syphilis now well recognized. It is probable that these two factors approximately offset each other and that these statistics represent fairly the frequency of relapses among patients in public practice.

EFFECT OF TREATMENT ON PROGNOSIS OF TERTIARIES

All of these statistics practically represent patients poorly treated and of the unfavorable class. The influence of treatment greatly diminishes the danger of tertiary syphilis. Fournier's statistics strikingly show this. In 2,396 cases of tertiary syphilis only 3 per cent. had been properly treated according to Fournier's standard of treatment, which is much less exacting than that of to-day; 19 per cent. had been treated moderately; and 78 per cent. had not been treated at all. Fournier estimated that four-fifths of his cases of general paralysis had had insufficient treatment, and Neisser, in 500 cases of tabes, estimated

that more than one-half had had no regular treatment, and only one-twentieth had had a proper course of treatment.

PROGNOSIS UNDER FAVORABLE CONDITIONS OF TREATMENT

Under present conditions of treatment if patients are seen during the first weeks of the chancre, and well treated, there seems every reason to believe that the disease can usually be eradicated, and its future dangers abolished. If treatment is begun early in the secondary stage of the disease and carried out vigorously, and with the complete cooperation of the patient, the danger of tertiary manifestations of the disease can be reduced, I believe, to a small fraction of 1 per cent. Unfortunately, these favorable conditions for prognosis do not obtain in most cases, even among the more favorable classes. The percentage of relapses of frank syphilitic lesions, like gummas, even in poorly treated cases in private practice, is small. My impression is that it runs well below 1 per cent. The slow chronic manifestations, particularly in the nervous and vascular system, are those whose frequency of occurrence it is most difficult to estimate.

THE PROGNOSIS AS REGARDS THE DANGER OF TABES AND PARESIS

It is impossible to determine by any statistics available, the frequency with which tabes and paresis follow syphilis. The frequency is undoubtedly magnified, first by the serious character of the complications, and even more by the fact that, while the most of the multitude that have syphilis show no evidence of the disease, every tabetic or paretic in a community stands out like a lighthouse.

C. J. White, in a careful study of 1,016 poorly treated syphilitics, men and women, whose histories he could trace, found that eight of them had developed tabes, and one had developed paresis; a total of less than 1 per cent.

Pick and Bandler found in 2,066 syphilitics, men and women, that 28 developed paresis or 1.3 per cent. Of 1,178 men, 2.12 per cent. developed paresis.

The most astounding statistics on the frequency of tabes and paresis are those of Mattauschek and Pilcz based on an investigation of syphilis among Austrian army officers in cases which had had little treat-

ment. Out of 4,134 cases 4.67 per cent. developed paresis, and 1.6 per cent. tabes; a total of 6.27 per cent. These are the highest ratios which, so far as I know, have been found anywhere. They are, of course, all among men, of the upper class, who are engaged in intellectual occupations, and who almost universally use alcohol.

Fischer found in 1,178 syphilitic men that 2.5 per cent. developed paresis, and 1.6 per cent. tabes; a total of 3.7 per cent. In 888 women 0.33 per cent. developed paresis, and 0.22 per cent. tabes; a total of 0.55 per cent.

As is evident from these statistics, paresis and tabes are greatly more frequent among syphilitic men than among syphilitic women.

The foregoing statistics vary so widely that no accurate estimate of the frequency of these nervous manifestations of syphilis can be made. I believe it may be stated that in men, whose syphilis is well treated and who lead a temperate life, the development of tabes and paresis is a rare occurrence. In syphilitics as a whole, regardless of the class of patients, or the thoroughness of treatment, I believe the frequency of these affections does not exceed 1 per cent. in men in the United States. The loss of life to mankind through its shortening by tabes and paresis is in the aggregate relatively small, I am convinced, compared with the vast loss caused by the shortening of life among syphilitics by the arterial changes of syphilis. There is, however, no doubt, that the dread of tabes and paresis is the great terror of syphilis.

TIME OF THE OCCURRENCE OF TERTIARY LESIONS IN SYPHILIS

The prospect of the occurrence of tertiary lesions of syphilis, excepting those of the nervous system and of the arteries, gradually diminishes with the age of the disease. According to Fournier's statistics, gummas are not uncommon in the first year of the disease. They are commonest from the second to the fourth year, reaching their maximum frequency in the third year. After that they gradually decrease, and are rare after the twentieth year. There is, however, no time limit beyond which they may not occur.

Forms of central nervous syphilis, other than tabes and paresis—syphilitic meningitis, syphilitic arteritis and gummas—occur like other tertiary lesions in the early years of syphilis. Two-thirds of the cases

occur in the first six years after infection; 20 per cent. occur during the first year; 35 per cent. from the second to the fifth year; and 25 per cent. from the sixth to the tenth year.

TIME OF THE OCCURRENCE OF TABES AND PARESIS

The manifestations of the sclerotic lesions of syphilis, tabes and paresis especially, have a tendency to show their results considerably later in the course of the disease. According to Fournier's statistics, with which others in general agree, their greatest frequency is from the eighth to the twelfth year, reaching a maximum in the tenth year. After the twelfth year there is a sudden drop in frequency, and the danger of their occurrence gradually vanishes in the next ten years. The results of the arterial changes in syphilis become manifest still later than those of tabes and paresis.

THE EFFECT OF SYPHILIS ON LENGTH OF LIFE

The individual who has had syphilis—even late manifestations of it provided they be in structures of little vital importance—may live out his allotted time. The disease does not necessarily shorten his life. Whether or not this happens depends altogether on the location of the lesions. The frequency, however, of the involvement of the vascular system and the occasional occurrence of tabes and paresis, which very materially shorten life, produce a considerable lowering in the average length of life of syphilitics as a class. Such definite figures as we have on this subject are obtained from the mortality statistics of life-insurance companies.

Bramwell, from an examination of the causes of death in 3,658 cases between 1888 and 1894 in English companies, estimated that syphilis shortened the expectancy of life of its subject four or five years, and that in syphilitics in whom tertiary lesions occurred the expectancy of life is reduced about ten years. He estimated that tabes, paresis and aneurysm alone reduced syphilitic expectancy one and three-tenths years.

Tiselius, in an examination of 5,175 policy holders with a history of syphilis in Scandinavian companies, found an actual mortality in 848 cases when the expected mortality was 660; that is, the excess mortality among the syphilitics was 28 per cent.

Gollmer compares with this the records of 5,385 syphilitic histories in 34 American companies which showed an excess mortality of 33.33 per cent.

Gollmer, examining the records of 1,778 syphilitic risks between 1852 and 1905 in the Gotha Life Insurance Company (Scandinavian), found an excess mortality of 68 per cent. for all ages.

The Association of Life Insurance Medical Directors and the Actuarial Society of America computed and published in 1914 a medico-actuarial mortality investigation of impaired insurance risks. This gives the most valuable statistics on the subject of the mortality in syphilitics that exists, because of the immense number of cases included, covering, as it does, the experience of nearly all the American life insurance companies. The number of cases known or suspected to be syphilitic, reaches the enormous total of 25,500 persons of all ages. The entire number gave a history of syphilis, but of the number 6,444 cases are tabulated as doubtful. Among these 25,500 cases there have been 328 actual deaths, while the expected deaths were 192.82; that is, these cases showed an excess mortality of almost exactly 70 per cent. The normal mortality rate for the American insurance companies is based on millions of risks, among whom, it is true, there are many syphilitics who escaped record, but in the aggregate they furnish, I believe, an accurate basis of comparison for determining the extra mortality rate of known syphilitic risks. I believe, therefore, that this mortality rate shown by 25,500 syphilitic risks, gives an accurate index of the reduction of life expectancy caused by syphilis. This extra mortality rate of 70 per cent. agrees closely with Gollmer's findings in the Gotha Company.

These statistics for American companies include policy holders of all ages from 20 to 60. These have an average life expectancy of a little over 35 years. Calculating on the basis of the average mortality rate for these ages, an increased mortality of 70 per cent. in syphilitics would mean a reduction in the average expectancy of life of 5.5 years. Because of the great experience on which it is based, I believe this estimate of the shortening of life by syphilis is accurate. It is interesting that Bramwell's estimate from a very much smaller number of cases of a shortening of 4 to 5 years from syphilis approximated this finding very closely.

Of course, as Brockbank has emphasized in commenting on the mortality statistics of syphilitics, deaths among syphilitics are not necessarily due to syphilis, but the fact remains that despite all care in selection, the mortality rate among insurance companies for risks who have had a history of syphilis is 70 per cent. above the average. And this calls attention to the fact for which allowance must be made in any study of the mortality of syphilitics, that syphilitic men as a class, apart from their syphilis, fall below the average in life expectancy. The class contains a large proportion, above the average of men in general, of those who are reckless of themselves; who live hard and fast and dissipate; and these factors, as well as the syphilis, contributes to the increased death-rate among them.

THE TIME OF LIFE AT WHICH THE DEATH RATE FROM SYPHILIS IS INCREASED, AND THE CAUSES OF DEATH FROM SYPHILIS

A study of insurance statistics indicates that the increased mortality among syphilitics is large between the ages of 30 and 45, and is greatest between 45 and 60. Between 20 and 30, and after 60 the increased death-rate from syphilis is slight. The reason for this is that the extra mortality among syphilitic risks is caused in very large part by diseases of the central nervous system, and of the heart and blood vessels and kidneys; and these produce their effects between the ages of 35 and 60.

CHAPTER X

SYPHILIS AND MARRIAGE

DURATION OF THE PERIOD OF INFECTIVITY OF SYPHILIS

The problem of syphilis and marriage is a somewhat different one for the syphilitic man and for the syphilitic woman. As has been stated in considering hereditary syphilis, the danger of the woman bearing syphilitic children decreases rapidly with time, and after the active years of the disease, she may bear healthy children. It has been shown, however, that she may in some instances bear syphilitic children even six, eight or ten years after infection. But this occurs in untreated cases; in well-treated cases the danger of bearing syphilitic children becomes negligible after five years, and as a rule it ceases much sooner. In general the facts as regards marriage are less favorable for the syphilitic woman than for the syphilitic man. The problem of the marriage of the syphilitic woman, however, arises so much less frequently than that of the syphilitic man that in this consideration of the subject the question of syphilis and marriage is taken up from the standpoint of the dangers in marriage when the man has had syphilis.

The questions in regard to marriage to be answered are: first, when can the syphilitic man marry without danger of having syphilitic children; and secondly, when without danger of infecting his wife. He has no right to marry until there is every reasonable assurance that he will cause neither of these accidents. The question of infecting his children requires no separate consideration, for recent investigations have shown that unless he infects his wife he will not have syphilitic children. The direct infection of the fetus by the male does not occur. The syphilitic fetus, or the hereditary syphilitic child means that the mother is infected, and that the infection of her offspring has taken place through her. The subject therefore reduces itself to the question, When can the syphilitic man marry with safety to his wife?

This whole subject is involved in the question of the duration of the relapses of secondary syphilis, for the contagious period of syphilis ends with the disappearance of secondary lesions; tertiary lesions are practically not contagious. The time when it becomes safe for the syphilitic to marry depends on the duration of relapses of secondary symptoms. It is necessary, therefore, to take up that problem in this connection. The question is for all practical purposes that of the relapses of secondaries in the mouth and genitals, for these are not only the dangerous lesions, but, unfortunately, they are the latest contagious lesions to relapse. For this reason in considering late relapses of secondaries, we have in mind the lesions in the mouth and genitals.

RECURRENCES OF SECONDARY SYMPTOMS

In the natural course of syphilis the occurrence of relapses is common during the first year. The tendency rapidly decreases with time, and during the second year relapses are infrequent. During the third year they are rare, and after the third year they are very unusual. In treated cases the frequency and extent of relapses is greatly diminished. In well-treated cases relapses are uncommon after the first eight months. In cases treated vigorously by present-day standards relapses may be entirely prevented in a very large proportion of the cases, and in cases in which the manifestations of the disease are not entirely aborted the frequency and extent of these relapses is very greatly reduced.

FREQUENCY OF RELAPSES

The facts with regard to the occurrence of relapses are well illustrated in the following statistics.

Sperk using modern methods of diagnosis in 1,518 cases of secondary syphilis in the prostitute class found relapses:

Once in 790 cases	5 times in 29 cases
Twice in 390 cases	6 times in 10 cases
3 times in 199 cases	7 times in 2 cases
4 times in 88 cases	

That is, in 1,518 cases, only 10 escaped relapses. This list covers the most unfavorable class of cases, for not only are they the ones

which have poor care, but local irritation is a predominant factor in causing relapses of secondary lesions in the mouth and genitals.

In the following list is shown the percentage of relapses found by different authorities treating syphilis vigorously by the use of mercury alone. Lewin, in 6,000 cases treated with sublimate injections, had 40 to 45 per cent. of relapses. Linden, with calomel injections, had relapses in approximately 30 per cent. of his cases. Neumann and Caspary estimated the number of relapses after vigorous inunction treatment as about 10 per cent. In the light of general experiences, it is probable that Neumann and Caspary underestimated the number of their relapses.

INFLUENCE OF THOROUGH TREATMENT IN PREVENTING RELAPSES

Coming to the most modern method of treatment in the hands of one of its most thorough exponents, Gennerich by treatment with mercury and salvarsan has been able to reduce the number of relapses in cases treated early in their course to 5 per cent. This means that in Gennerich's service the infective period in syphilis is reduced to a few weeks in 95 per cent. of his cases. Gennerich's experience has been in military practice where the conditions are best for thorough treatment, but the experience of competent men everywhere is that by thorough treatment, instituted early in the course of the disease, the frequency and extent of relapses can be reduced to a point that means that only a small proportion of cases is infectious after the first few weeks of the disease.

SANITARY IMPORTANCE OF PREVENTING RELAPSES

This reduction in the frequency and duration and extent of relapses effected by recent advances in treatment is of the greatest practical importance; not so much for the patients themselves, but because of the reduction which it effects in the dangers of transmitting the disease. It means that by proper treatment the prospect of the occurrence of infectious lesions of syphilis can be diminished four or five times and that the length of the period during which cases are infectious can be reduced in 90 to 95 per cent. of the cases from a period of one or two years to one of a few weeks. If treatment

of this sort were available early for most of the cases of syphilis, it would mean that these cases, instead of being more or less dangerous to those that come in contact with them for a year or more, would for the most part cease to be dangerous after the first few weeks of manifestations of the disease. This prevention of relapses by treatment is potentially the most important means of checking the spread of syphilis which we now have.

Although by modern methods of treatment the percentage of relapses may be reduced to 5 or 10 per cent. of the cases, it is true, as Hoffmann has emphasized as a result of his experience, that no treatment can absolutely assure the non-infectiousness of the syphilitic in any given case in the early years of the infection.

TERMINAL LIMIT OF INFECTIOUS LESIONS

It has been long known that under the ordinary methods of treatment some cases relapsed for several years. Fournier, in particular, has emphasized the possibility of the recurrence of late infectious lesions six and seven years after infection. Recent investigations have demonstrated that, in unfavorable cases, relapses may occur long after the time when cases as a rule cease to be contagious. Hoffmann has seen the recurrence of contagious lesions from five to ten years after infection. Nielsen has found active spirochetes in recurrent lesions from nine to twenty-four years after infection, and numerous other observers have recorded the similar recurrence of infectious lesions in rare cases for several years after the infection. It is, therefore, impossible to set with mathematical absoluteness any terminal limit beyond which infectious lesions cannot occur. It is easy, however, to exaggerate the practical importance of this fact. These late recurrent lesions are found in cases which have been untreated, or poorly treated, and even in such cases the occurrence of these infectious lesions seven, eight or nine years after infection are so rare as to be pathologic curiosities. The fact that they do occur in rare, unfavorable cases does not in any material degree counterbalance the weight of enormous experience which shows that, in patients who have not been thoroughly treated, the dangers of contagious lesions rarely continue beyond three years and are reduced almost to the infinitesimal after five years.

SYPHILIS AND MARRIAGE

Before the recent advances in our knowledge of syphilis, practical rules for the marriage of syphilitics had been found as the result of long experience whose working thoroughly justified their adoption. These rules all recognized the importance of persistent treatment, but they were based on the fact that the most important factor in diminishing the infectivity of syphilis is time; and that from three to five years in well-treated cases represents the practical elimination of the dangers of transmitting the disease.

This fact is well illustrated by Keyes, who, from examination of his private records of syphilitic patients who married while actively syphilitic and took no particular precautions to prevent infection, comes to the following estimates: During the first year of his disease the chances that the syphilitic husband will infect his wife are 12 to 1; during the second year 5 to 2; during the third year 1 to 4; and all but nothing after the fourth year. Infections were recorded in two cases in the fifth year, but none of his cases of late infection was found among patients who had been well treated.

WHEN MAY THE SYPHILITIC MARRY?

The following views are representative of the opinions held on this subject at the beginning of this century:

Taylor, one of the best American authorities of the last generation, held that with energetic and thorough treatment the syphilitic man can marry after two to two and one-half years, and have healthy children.

Keyes believed that it is practically safe for the syphilitic to marry after five years if during the last two he has had no treatment, and has yet remained free from symptoms.

Morrow's rule was that it is safe for the syphilitic man to marry, provided that he has received sufficient specific treatment; that four years have elapsed since infection, and that he has been free from manifestations of syphilis for eighteen months. "Such a rule has been demonstrated by a large clinical experience to be perfectly safe to be applied as a working formula, and the man who has fulfilled these conditions may be accepted as a safe risk in marriage."

Fournier, who was the greatest extremist on this subject before the present period in syphilis, formerly allowed marriage after four or five years, but at the last he held that the syphilitic man should not marry before the sixth or seventh year.

The conservative opinions of the present day conform practically to the rules of the clinical period.

Gennerich, having in view patients treated by the very vigorous methods which he uses, believes that marriage is entirely safe after two years, if there have been no relapses, and if the Wassermann has remained negative, and cannot be reversed to positive.

Hoffmann, in spite of modern developments, adheres to the old-established rule: If the patient has been vigorously treated, he may marry in from three to five years after infection, provided he has been free from symptoms for two years. Contrary to Gennerich, he does not believe that with our present brief experience it is safe to shorten the waiting time by the use of salvarsan.

The extreme views of the new generation of syphilographers go far beyond the old rules or the conditions as laid down by Hoffmann. Ignoring the fact established by long experience that, even if evidence of the presence of tertiary syphilis exists, syphilitics are not dangerous after secondary relapses cease, they would practically require a demonstration of the absence of all ascertainable evidence of syphilis in the candidate for marriage; not only that secondaries have ceased to recur, but that the Wassermann reaction shall remain negative after many tests, and even that the spinal fluid shall be tested and found negative for syphilis. The Wassermann reaction, in particular, is set up as a criterion for marriage, and one state has gone so far as to enact that at least the male partner to marriage must have a negative Wassermann.

As a matter of fact, recent investigations have simply confirmed the fact which clinical experience had before established, that, under unfavorable conditions, the possibility of transmitting syphilis might in rare cases exist considerably beyond the usual time of from three to five years. Nothing startling or of fundamental importance has been discovered to demand any radical change in our views as to the late contagiousness of syphilis. A calm consideration of our present knowledge brings to light nothing to demand the overthrow of the long-estab-

lished rules for the marriage of syphilitics. They have proved as safe as any practical rules of conduct can. To be sure, it is impossible ever to say that it is absolutely safe for a syphilitic to marry. But this statement, when detached, is far more terrifying than when it is considered in relation to our rules of conduct in all other affairs of life. Safety is a relative term, and it is never absolutely safe to do anything. Certainly it is never absolutely safe to marry. No man can be given positive assurance that marriage will not be the direct cause of the death of his wife, or that he will not have children with deformities that are as hideous as syphilis can be. In this strict sense of the word it is never absolutely safe for the syphilitic to marry, but in the ordinary usage of the term safe, abundant experience has shown that the marriage of syphilitics under the old rules is safe.

In particular, the modifying of the usual rules of marriage for syphilitics by requiring a negative Wassermann is not warranted. All of the old rules took no account of the Wassermann test, for the Wassermann test did not exist; and we know now that under old conditions of treatment the Wassermann reaction remained positive in a large percentage of cases regardless of the length of time that elapsed. And yet experience has shown that these patients —50 per cent. of them with positive Wassermanns—after five years had healthy children. The explanation is this: The Wassermann test is as much a regular symptom of tertiary syphilis as it is of secondary syphilis, and patients in the tertiary stage of syphilis may have healthy children, although their Wassermann reaction is positive; just as they may have healthy children in the face of the fact that they have active clinical manifestations of tertiary syphilis. If the Wassermann is positive in the first three years of syphilis, it is a reason for lengthening the time limit for marriage, but in old syphilitics it indicates nothing as to the danger of transmitting the disease. In late syphilis it alone does not constitute a reasonable barrier to marriage.

With such a subject as syphilis and marriage, to proceed on the basis of probabilities, as we do in all other affairs of life, is apt to be regarded as harsh and brutal. In regard to the conditions of marriage, man is inclined to demand at least the pretense of perfection. But as Jonathan Hutchinson has so wisely said in this connection, "Councils of perfection are by no means always wise ones," and, while

it is an easy way out of a difficult situation to offer such councils, the one who pursues this easy course, often as a matter of fact unwittingly assumes tremendous responsibility. There is this responsibility in demanding perfection as the conditions of marriage for the syphilitic. When marriage is denied it prevents the formation of a family unit and it means the denial of life to potential children. This is a heavy responsibility to accept, if the requirements have been complied with that reduce the contingent dangers to a point of practical safety. Within my personal experience I can see scores of successful marriages, and two or three times as many scores of normal children that would not exist if there had been demanded as a prerequisite of marriage absolute safety as regards the possibility of future syphilis.

MODERN STANDARD FOR MARRIAGE OF SYPHILITICS

What then, in the light of our newer knowledge and of our long clinical experience, is a reasonable standard of requirements for the marriage of syphilitics? The standard laid down by Hoffmann, as given above, is eminently sane and safe. Equally safe is the old clinical rule, that a patient may marry five years after infection with syphilis, provided that during the first three years he has been thoroughly treated and during the last two has shown no manifestations of the disease. And this regardless, as Keyes, Jr., has recently emphasized, of the Wassermann reaction at the end of five years. If these conditions are complied with there is as much assurance of safety as is demanded in the conservative conduct of any of the important affairs of life.

CHAPTER XI

THE ETIOLOGY OF SYPHILIS

THE PREVALENCE OF THE DISEASE AND THE MEANS OF ITS TRANSMISSION

Syphilis is a disease confined to man. As we have seen, it can be produced under artificial conditions in certain animals, but even among the higher apes, in which it pursues a course nearest like that in man, the natural immunity to it is sufficient to cause its disappearance.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of syphilis includes all inhabited parts of the earth whose people have come in contact with the outside world. There are doubtless still some peoples whose isolation is so complete that they have never yet had contact, either direct or indirect, with the rest of the world, and among whom syphilis has not yet appeared. But, excepting these, syphilis has gone over the entire world. The susceptibility of all mankind to syphilis is apparently about the same. It is said that the Icelanders are relatively immune. With this questionable exception, no variation in susceptibility among different peoples has been noted.

SOCIAL DISTRIBUTION

It is distributed through all social classes. Its prevalence and its ravages increase with the descent in the scale of civilization; its prevalence increasing with the descent in the scale because sexual habits become looser, and its ravages increasing because of the lack of treatment and of the unfavorable conditions under which it occurs. Among civilized men its social distribution is dependent on the factors which influence sexual morality. Whatever makes for looseness in

sexual relations increases the prevalence of syphilis. It is commoner in urban than in strictly rural populations, and most statements assume that it is commoner in the large cities than in towns. My own impression is that there is little difference between these two.

COMPARATIVE FREQUENCY OF SYPHILIS IN MEN AND WOMEN

Syphilis is considerably commoner among men than among women. Some authorities put their estimate as low as two or three times commoner in men, while others estimate it as eight or ten times commoner in men. Fournier, in 11,000 cases in his practice had ten times as many men as women, but statistics of private practice and statistics of many public institutions are unreliable on this point, because they may not be frequented equally by the two sexes. The proportion of syphilitic women is much larger in public practice than in private.

The prevalence of syphilis among women appears to be less than it really is for the reason that it often runs so mild a course that it is overlooked, or is given no attention. It is also much less likely to be suspected, and hence escapes detection. In my opinion an estimate that syphilis is eight or ten times as frequent among men as among women is certainly an exaggeration. It is, however, likely that it is two or three times as frequent.

PREVALENCE OF SYPHILIS

Estimates of the prevalence of syphilis among the people of America and Western Europe vary considerably among different authorities. According to Erb, 12 per cent. of the adult male population of Berlin is syphilitic. Le Noir estimated for Paris that the proportion of syphilis in the adult male population was not less than 13 per cent., and probably nearer 15 per cent. Fournier's estimate for Paris was 13 per cent, and for London 12 per cent. Erb found among 10,000 men of the better class in his private practice, that, excluding tabes, 21.5 per cent. were syphilitic.

Blaschko, who has given much attention to the social and economic importance of venereal diseases, and who is perhaps an alarmist, estimates that 45 per cent. of the clerks and shopkeepers in Berlin between the ages 18 and 28, have syphilis. Pinkus is quoted by Flexner as say-

ing that one man in five in Germany has had syphilis. Collie, of the British Venereal Commission, in a Wassermann survey of 500 healthy workingmen, found that 9.2 per cent gave a positive reaction. Barrett, in a Wassermann survey of practically all patients attending for four months at an eye and ear clinic in Melbourne, Australia, found 14.4 per cent. syphilitic.

The best estimates that we have in America come from some examinations of men in the public services. Reasoner, from a study of one regiment of the United States army, estimated that 7 per cent. of the men were syphilitic. Bartlett, for another regiment, estimated that 10 per cent. were syphilitic.

The United States Public Health and Marine Hospital Service, formerly the Marine Hospital Service, furnishes medical service to patients —almost exclusively men—who are engaged in maritime occupations on the rivers and lakes, as well as on the ocean. The number of cases treated, as shown by its annual reports for the last 35 years, ranges from 30,000 to over 50,000 per annum in recent years. According to their reports, from 1881 to 1914 the number of cases of syphilis treated varies from 6 per cent. to 9.7 per cent. of the total number of cases. This would indicate probably at least 10 per cent. of syphilitics in this class of patients, for the number treated for syphilis would certainly fall considerably below the actual number of those who had the disease but were entered in their reports as treated for other diseases.

Vedder and Hough from a valuable study of 1,283 cases in government hospitals for men in the public service from all parts of the United States, estimate that 10 per cent. represents closely the prevalence of syphilis among men in the United States.

Nichols, of the United States army, who has given great attention to the subject of syphilis in the army, believes that for the army as a whole the rate is something over 5 per cent, and, contrary to the common impression that syphilis has a high percentage in the army, he brings forward good reasons for believing that the prevalence of syphilis is not higher in the army than among men in general of the same age.

There are, therefore, many authoritative estimates which place the proportion of syphilis among the male adult population of European

cities at more than 10 per cent., and among males in the United States at between 5 and 10 per cent. These statistics, indicating a greater frequency of syphilis in European cities than in America, reflect accurately, I believe, an actual difference in degree of its prevalence.

SYPHILIS IN THE UNITED STATES

It is certainly a conservative estimate, in the face of such statistics as we have, to place the percentage of syphilitics among the adult male population of the United States, at more than 5 per cent.

If syphilis is five times as frequent among men as among women, more than 1 per cent. of the women are syphilitic, and more than 3 per cent. of the entire adult population are syphilitic. That is, there are now* approximately 1,200,000 adult syphilitics in this country. And these figures probably considerably underestimate the facts. This gives some intimation of the widespread extent of syphilis, and of its enormous importance. It means that as a result of its late manifestations it causes in the aggregate an enormous wreckage of human life.

IS SYPHILIS ON THE INCREASE?

On the interesting and very important subject of the increase or decrease of syphilis, the annual public health reports of the United States Marine Hospital Service give valuable information. For the ten years, 1881 to 1890, treating from 30,000 to 50,000 patients a year, the percentage suffering from syphilis of the total number of patients was the following:

	Percentage
1881	9.7
1882	8.8
1883	8.2
1884 and 1885	7.6
1886	8.3
1887, 1888 and 1889	9.2
1890	8.4

* The United States Census Bureau estimates that the population of the United States reached 100 millions on April 2, 1915

For the last five years, 1910 to 1914, with the total number of cases treated ranging from 50,000 to 53,000, the percentage of syphilitics treated has been the following:

	Percentage
1910	7.9
1911	7.5
1912	6.0
1913	8.8
1914	7.7

As far as these figures go they would indicate an actual slight decrease in the prevalence of syphilis in recent years, but as a matter of fact, the maximum and minimum between 1881 and 1914 are 6 and 9.7 per cent. and the average runs close to 8 per cent. for the entire period. These statistics covering more than a million cases and extending over a period of over thirty years, are exceedingly interesting in relation to the subject of the increase or decrease of venereal diseases. They are much more reliable as throwing light on this question than on that of the actual prevalence of venereal diseases. They represent the most unfavorable class for syphilis. Unmarried men, or men whose domestic ties by reason of their occupation are the slightest, compose the class, and they would respond most sensitively to any increase in the disease.

It seems likely that syphilis is not on the increase. After becoming established among a people, syphilis does not increase in geometrical ratio, each new case infecting so many more individuals. Its prevalence is determined in large part by the sexual habits of man; and these vary little. The permanent prevalence of syphilis, therefore, will remain at a fairly definite standard unless measures are taken to reduce its contagiousness. In the present situation of the world, with practically no effort made at the sanitary control of syphilis, its prevalence may be said to be its normal prevalence; that is, its prevalence as controlled by the habits of man. It is likely—and the statistics quoted above of the Marine Hospital Service might be used in support of this proposition—that syphilis is slightly on the decrease as a result of the attempts of recent years to inform the public of its dangers. Men are more alive to these than formerly, and as a result of this there is probably an inappreciable decrease in its prevalence.

AGE OF CONTRACTING SYPHILIS

Fournier found the disease most frequently contracted between the ages of 20 and 26 in men—the maximum being the twenty-third year — and between the ages of 18 and 21 in women — the maximum being the twentieth year. Of the men 8 per cent., and of the women 20 per cent contracted syphilis before the twentieth year. These statistics of Fournier are quite in accord with general experience that the time when syphilis is most frequently contracted is during early adult life.

DANGEROUS LESIONS OF SYPHILIS

As has been stated elsewhere, the practically infectious lesions of syphilis are those of the primary and secondary period. As regards the chancre—the lesion of the primary stage—and the lesions of secondary syphilis, there is no difference in their degree of infectivity. Animal experiments have confirmed experience that syphilis can be inoculated with equal ease from primary or secondary lesions. The tertiary lesions of syphilis are also potentially infectious, but the inoculation of experimental syphilis from tertiary lesions occurs successfully only under conditions so entirely different from the natural conditions of contact with them, that it shows that, except under artificial conditions of experiments, the transmission of syphilis from tertiary lesions is highly improbable, if not in fact impossible. It follows, therefore, that the infectious dangers belong to the primary and secondary lesions of the diease.

Animal experiments have further shown that syphilis can be experimentally inoculated from almost every tissue in the body, and that every lesion of syphilis is potentially infectious. The conditions of animal experiments do not apply to the practical propagation of the disease. Syphilis might readily be artificially inoculated from spirochetes in the spinal cord, for example, but if the spirochetes were confined to the spinal cord the patient would practically be absolutely safe as regards infection of others. Syphilitic tissues, even abounding in spirochetes, are not dangerous if the spirochetes cannot gain access to the surface and come in contact with uninfected individuals. Lesions of the internal organs, therefore, from which

the spirochetes have no means of exit to the surface of the body, do not transmit the acquired form of the disease. For syphilis to be transmitted spirochetes must be directly transferred, and the practical dangers to others of syphilis lies in the lesions containing spirochetes which are on the surface of the body, or which are so placed that spirochetes from them may come in contact with other persons. Even in the most contagious stage of syphilis, lesions which are covered by unbroken skin are not contagious. It is only from the moist lesions—lesions which have a weeping or ulcerating surface from which the spirochetes can escape—that the disease can be contracted. As a practical fact, the dangerous lesions of syphilis are largely confined to the mouth and genitals and contiguous skin. In these locations, not only are the conditions for the transmission of the disease most favorable, but, as Hoffmann has pointed out, the conditions are ideal, especially in the female genitals, for the growth of the spirochetes.

Transmission of syphilis by the body fluids, except in the case of congenital syphilis, is practically not a danger of the disease. The blood is the means by which the spirochetes are transmitted to the fetus in hereditary syphilis, but, even during active syphilis, experiments show that the spirochetes in the blood are so few that blood, which is not contaminated by flowing over open active syphilitic lesions in its escape from wounds, is practically not dangerous in such contact as occurs with surgeons and nurses in operative manipulation of syphilitic patients. The same holds true for the milk of syphilitic women, and for the urine and semen. The study of the Wassermann reaction demonstrates even that such a thing as seminal transmission of syphilis to the ovum does not occur; for every mother of a hereditary syphilitic child is the subject of syphilis.

To summarize, contracting syphilis by direct infection means contact with active moist syphilitic lesions, and the practical dangers are attached chiefly to the lesions of the genitals and mouth, which are always moist lesions.

INFECTION BY INDIRECT TRANSFERENCE OF THE DISEASE

Syphilis can be contracted by indirect transference of the spirochetes through some intermediate object, which first comes in contact

with an infectious syphilitic lesion and then with an abrasion in the skin or mucous membranes of an uninfected person. This indirect method of the transference of syphilis has long been known. The conditions limiting it, however, have only lately been determined. It was established by clinical experience that for mediate infection with syphilis the time elapsing between the deposit of the virus on the intermediate object and the infecting contact is limited to a few hours, approximately eight or ten. Experience had also shown that the contagiousness of syphilitic dead bodies is rapidly lost. Infections in making postmortems on syphilitics have been almost unknown, and infection from syphilitic bodies dead more than twenty-four hours have been quite unknown.

VIABILITY OF THE SPIROCHAETA PALLIDA

The experimental studies of the last few years have completely confirmed the low resistance and the very short viability of the *Spirochaeta pallida* outside the human body. Under artificial conditions it can be kept alive for several days. Noguchi has succeeded in cultivating it in vitro and it can be grown thus for an indefinite period. But, except under these entirely artificial conditions, its life outside of the living body is fortunately limited to a few hours. Kept under ordinary conditions, it loses its movements in five or six hours. Even under anaerobic conditions—and in the absence of air its viability is highest—it loses its motility in two days. By inoculation of apes it has been proved to be active only up to six hours after removal from the body. Material from chancres and condylomas, even when kept moist, remains virulent only from six to ten hours. Twenty-six hours after the death of a syphilitic patient Jacquet and Sezary found the spirochetes all motionless, and Levaditi found them all motionless thirteen hours after death in a syphilitic child.

They have also the weakest power of resistance. They are not affected by normal salt solution, but plain water or water containing a greater quantity of salt than is found in the blood destroys them almost immediately. They are almost instantly destroyed by the common antiseptics. Exposure to a temperature of 51 C. (123.8 F.) destroys them in one hour. At 10 C. (50° F.) they are destroyed in three hours. They can be kept alive for twenty-four hours on ice.

All this means practically that the danger of mediate transference of syphilis arises only when contact with a contaminated object takes place in a short time—at most six or eight hours—after its contamination, and that vigorous scrubbing with soap and water or with antiseptics is effective in destroying the infection. It is fortunate in the highest degree that the viability and resistance of the *Spirochaeta pallida* outside of the living body is so slight. Intermediate transference of syphilis is now an occurrence of common observation. The organism of tuberculosis remains virulent under favorable conditions for a couple of months or more; if this were true of the *Spirochaeta pallida,* it staggers one to imagine what would be the ravages of syphilis.

Even as it is, all sorts of objects for common toilet use in public places are occasional sources of syphilitic infection. The most dangerous of these is the public drinking-cup placed where it is used by a large number of young adults. The transmission of syphilis by drinking-cups is not an extremely rare accident. The transference by water-closet seats is surprisingly rare. Any article which may come in contact with a moist surface, and be passed immediately from a syphilitic to another person may be a source of indirect transference of syphilis. This applies to such articles as spoons, forks, toothbrushes, pipes, and the instruments of physicians, dentists, nurses and barbers, but, as a matter of fact, it is very rare to be able to trace infection to such a method of transfer except among unusually dirty people.

EXTRAGENITAL CHANCRES

In almost all cases of syphilis contracted through indirect infection, and in a certain proportion of the cases caused by direct infection, the disease begins with an extragenital chancre. Extragenital chancres occur in every conceivable location on the body. They are rarely seen, however, except on the hands or face or mouth. They occur most frequently on the lips, and after that, in the mouth or on the tonsil. After the lips and mouth their occurrence is most frequent on the hands, because of the number of cases of infection with syphilis on the hands which occur in doctors and dentists. The great cause of chancres of the lips and mouth is kissing. The mouth of every

syphilitic which contains mucous patches is virulently contagious, and, as such lesions may be of such minute size as to escape observation, it makes kissing by persons in the active stage of syphilis a very dangerous act. How dangerous it may be is shown by the fact that Schamberg has recorded the infection of seven young girls by one young man at a party where a kissing game was played.

Extragenital chancres represent a small proportion of all infections with syphilis. Bulkley, and D. W. Montgomery each estimates the proportion as more than 5 per cent. of the entire number. Nichols estimates their proportion for the army as from 6 to 7 per cent. Of the whole number of chancres they constitute less than 10 per cent.

GENITAL CHANCRES

The remaining 90 to 95 per cent. of syphilitic infections occur about the genitals, which means that 90 to 95 per cent. of syphilis is due to sexual contact with syphilitic individuals. It does not, however, mean that 90 to 95 per cent. of syphilis is contracted in irregular intercourse, for in women a considerable proportion of the genital chancres are due to infection from their husbands. Fournier in private practice found that at least 20 per cent. of female syphilis was acquired in marriage.

SYPHILIS AND PROSTITUTION

The great source of the propagation of syphilis is prostitution, either open or clandestine. The women who accept promiscuous intercourse do not go far before they are exposed to syphilis; and it follows, of course, that the prevalence of syphilis among promiscuous prostitutes is enormous. As a matter of fact, it is practically universal. Osler quotes a Wassermann survey of the prostitutes of Cologne that showed that 85 per cent. of them had a positive reaction. That is as high a percentage of positive reactions as is obtained among known syphilitic patients. Pappee, in a survey of prostitution in Lemberg, came to the following conclusions:

1. Eighty to eighty-five per cent. of prostitutes in the course of their careers acquire syphilis.

2. Forty-six per cent. of syphilitic prostitutes had recent manifestations, although in one-third of these cases the disease was over three years old.

3. Thirty per cent. of the syphilitic prostitutes were in the first to the third year of the disease—the dangerous contagious period.

4. In 31 per cent. there were no manifestations after the third year of the infection.

5. Of prostitutes in the first to the third year of their infection, 37 per cent. were under 20 years of age, and 42 per cent. were between 20 and 25 years—79 per cent. of those in the most dangerous period of the disease were under 25 years.

According to Pappee, Wwednesky, in St. Petersburg prostitutes, found only 39 per cent. clinically free from syphilis. Raff, in Breslau, found 32.1 per cent., and Sederholm, in Stockholm, in 2,131 cases, found 35.1 per cent. free from syphilis.

All this means, of course, that the promiscuous prostitute is practically always syphilitic. Fournier, in Paris, where the regulation of prostitution has been in force, found syphilis less prevalent in the open prostitute than in the clandestine; and it is a common assumption that the clandestine prostitute—the woman who sells her favors but is not in the open market—shows a greater frequency of syphilis than the promiscuous prostitute, and is a more dangerous carrier of the disease. In the face of the foregoing statistics it is hard to see how she could be a more dangerous carrier of the disease than the open prostitute, and it is hard to reconcile with reason the assumption of the greater prevalence of syphilis in the clandestine prostitute. The greater the number of men with whom the prostitute comes in contact, the greater is the danger of her infection. The promiscuous prostitute meets a much larger number of men than the clandestine, and it seems, therefore, impossible to avoid the conclusion that as a class she is the more commonly infected with syphilis. It is nevertheless true, that clandstine prostitution is a potent factor in the spread of syphilis; so potent that its dangers are hardly less than those of open prostitution.

Why is it, then, if syphilis is so widespread among prostitutes, that almost every contact with a prostitute is not followed by syphilis? There are several reasons why infections may not occur.

First, the exposed person may have considerable natural resistance to the disease, and an exposure that would result in an infection in

another person may fail. That a considerable relative difference of resistance to syphilitic infection exists among individuals there are good grounds for believing.

Second, for infection to take place there must exist a break in the skin or mucous membrane, *even though it may be only microscopic in size.* If no such break exists infection will be escaped.

These two factors, particularly the latter factor, account for many escapes from syphilitic infection. Much more important than these factors are those which pertain to the infected person.

Third, the woman may be in a condition of active syphilis, and yet have no open infectious lesions. This is unlikely.

Fourth, the greatest factor of safety in the syphilitic prostitute lies in the fact that after she has had syphilis for a few years, open infectious lesions are apt to cease, and in the absence of these the disease is not transmitted. It is the young prostitute; the woman in the first few years of the business who is the dangerous carrier of syphilis.

CHAPTER XII

THE PROPHYLAXIS OF SYPHILIS

Syphilis is a disease of man infectious only by direct contact of its organisms with skin or mucous membrane at a point where there is a break in the surface. Medicine has fully established that these are the necessary conditions for the transmission of acquired syphilis. With the terms of the problem of transmission of syphilis completely known and so simple, the prevention of its spread would be easy, were not the disease essentially bound up with the impelling force of the sexual appetite. This makes its prophylaxis only in part a sanitary problem.

The sanitary attack on syphilis as an infectious disease can be made from two directions; that of limiting the contact of the infected with the healthy, and that of protecting the healthy from the dangers of contact with the infected.

ISOLATION

Isolation or quarantine, which is practicable for acute infectious diseases or rare chronic infectious diseases, is, of course, impossible, as a general measure, for a disease so prevalent and so chronic in its course as syphilis is. The most that can be done in such a situation is to minimize as far as possible the dangers of the disease; to treat it in such a way that its infectious lesions are reduced in number and its course shortened. It is fortunately true that we are at present able to do this by the use of remedies better in syphilis than in any other chronic disease.

THE THERAPEUTIC ATTACK ON SYPHILIS AS A SANITARY MEASURE

Provision for the Treatment of Syphilitics.—As has been pointed out, the infectious lesions of syphilis can be reduced to a very small number, and their duration in 90 to 95 per cent. of the cases brought

down from a year or more to a few weeks. The significance of this fact is of the highest practical importance in the prophylaxis of syphilis. The world over now, except in a few fortunate spots, the contagious course of syphilis runs through several months; and yet it is capable of demonstration that if steps were taken that would insure thorough intelligent treatment of syphilis, it would reduce this contagious period immediately to a corresponding number of weeks. This means that it would make the dangers to the community at least one-third or one-fourth of what they are now, and this in turn would mean a corresponding reduction in the prevalence of one of the world's most serious diseases. To obtain the complete benefit of this plan would require, of course, that every syphilitic should be treated in the early stage of his disease, but, unlike most other sanitary measures directed to the syphilitic, the partial carrying out of the plan does not mean its complete failure. Every syphilitic thoroughly treated early in the course of his disease means the removal of one of the causes of its spread; if you cannot treat every syphilitic in this way, whatever number you do succeed in treating reduces by so much the further spread. This measure is one which is useful in proportion to the thoroughness with which it is carried out, but it is not wholly a failure if not universally applied.

To obtain the full benefit of the therapeutic attack on syphilis as a sanitary measure would require that the plan be applied on a very large scale, and that free treatment be provided by the state as a sanitary measure. In spite of the extent of syphilis, such an undertaking would not be one of colossal proportions. The early syphilitic, the one who for the protection of the state needs treatment, is not bedridden; he is not usually even ill, or estopped from his occupation. The thorough treatment of syphilis in its early course can be carried out upon ambulant patients. This plan, therefore, would not require the provision of large hospital facilities. It would require, however, dispensaries to which access is free, unquestioned, and easy, and that in these dispensaries such care should be taken of the patients as to give them confidence and make them quick to seek its benefits.

Any systematic provision of such opportunity for treatment is lacking now to a degree that is amazing in view of the possibilities of general public benefit that would result therefrom. Dispensaries as

a rule take care of syphilitic patients, but, with the rarest exceptions, they are not provided with even the moderate equipment necesary to take care of them properly. To take a concrete example: In Chicago we have many dispensaries where patients can get free treatment for venereal diseases. We have one large hospital with two wards of from 75 to 100 beds each, and only one, in which venereal patients can get free care. But I know of no place in Chicago that is properly equipped for taking care of a considerable number of syphilitics, or which feels that it has a great public responsibility in protecting the public by caring for them in such a way as to free them as quickly as possible from their contagious dangers. Most public hospitals in Chicago, as all over the world, assume the unconscious attitude that the syphilitic is responsible for his own misfortune, and of all the sick, except those with other venereal diseases, is least worthy of charity; ignoring the fact that worthy or unworthy, he is a public danger, and the greater danger the more unworthy and vicious.

The essence of this plan is that there should be systematic and abundant provision for the treatment of syphilis. This is a fundamental necessity. Everything else is subsidiary to this, and in large part is easy after this has been provided. The equipment of dispensaries to treat syphilis and other venereal diseases would not be elaborate or expensive. Except for ordinary equipment in the way of buildings and furniture, it would require very little extra equipment. But a small amount of necessary equipment for diagnosis and treatment is absolutely essential to the successful carrying out of the plan. It is in the lack of the necessary equipment for diagnosis that dispensaries and hospitals at present, for the most part, completely fail with respect to syphilitic patients.

Of course the success of any such plan would involve the education of the public to its existence and to the importance of the early treatment of syphilis in order to cure it. This would involve educating not only the classes who apply for free treatment, but, to do the most public good, those also who are treated by physicians in private. The medical profession, as well as the public, needs information as to the importance of the early diagnosis and treatment of syphilis. This is coming gradually and nothing would hasten it more than the

inauguration, as a matter of public safety, of systematic provisions for its prompt and early treatment.

If abundant provisions existed for the efficient treatment of venereal diseases, the time would soon come when most patients would readily avail themselves of the opportunity for treatment. Experience of such institutions as the St. Louis Hospital in Paris shows that most patients will seek treatment for syphilis when they know where to turn. The prostitute classes, in particular, who are the greatest public menace, are anxious to get rid of their disease and seek treatment. There is, it is true, a certain proportion of the wholly depraved and vicious or ignorant, who will not take advantage of such opportunities when offered to them freely, but this is a small proportion of the whole number of syphilitics that seek the benefit of public practice. For these vicious and careless, measures might justly be enacted that would make the neglecting of an active case of syphilis a serious offense, and the transmission of syphilis by sexual contact during its active stage a criminal one.

This therapeutic attack on syphilis has been the line of procedure in the Scandinavian countries for more than a century. The method in the past, however, has offered no such possibilities of vast public benefits as it offers now. It is only within the last five years since it has been shown that the secondary course of syphilis can be controlled by the use of mercury and salvarsan that the plan has opened up such enormous possibilities as a sanitary measure.

So much emphasis has been placed on the systematic provision for the thorough treatment of syphilis as a sanitary measure, because it is the one efficacious measure which it is possible to apply in the direction of protecting the public from contact with the infection. This plan of attack on syphilis has the advantage that it is complicated by none of the social or moral difficulties that seem to render futile all attempts to reduce the dangers of syphilitics to the community by every sanitary measure which involves the recognition of the venereal classes. It involves no legal recognition of prostitution; no segregation; nor certification of health. It does not involve necessarily even the notification of syphilis. It only necessarily involves the humane proposition of offering treatment to the diseased. Aside from the fact that none of the plans for sanitary regulation of prosti-

tution, as such, will be tolerated in communities with a predominating Anglo-Saxon sentiment, there is room for differences of opinion as to their efficacy from a purely sanitary standpoint. There can be no room, however, for difference of opinion as to the efficacy of thorough early treatment of syphilis in minimizing the dangers to the public of every case so treated.

The second direction of sanitary attack on syphilis consists in protecting the public against the danger of contact with the infection.

THE DANGER OF COMMON USE OF PERSONAL ARTICLES

In this category come provisions against indirect infection from contact with contaminated articles. Much can be done, and a large amount has been done in the last few years, by educating the public to the dangers of the common use of personal articles in public places. Public drinking-cups and public towels are sufficiently dangerous to warrant their prohibition. The public should be educated to the general fact that personal articles in public places are not safe for common use. The necessity for care to avoid infection should be recognized with regard to all occupations that have to do with manipulating the body, or taking care of its physical needs. The barber, the manicure, the chiropodist, the masseur and Turkish bath rubber; and even the doctor, the dentist and the nurse may be the means of conveying syphilis; and the careless and dirty individual in any of these occupations should be avoided. In particular, pressure should be exerted upon the dirty barber shop to control the possibilities of infection that exist there. More dangerous than the barber shop, are restaurants and other public places for furnishing food and drink. The danger in these lies chiefly in the fact that their servants largely belong to the semirespectable class who so frequently have syphilis.

THE PERSONAL PROPHYLAXIS OF SYPHILIS

The real problem in this direction of attack on syphilis, is that of protecting the public against the dangers arising from actual contact with syphilitic persons. From 90 to 95 per cent. of syphilis arises from sexual contact; were it not for this method of origin, syphilis would soon cease to exist. In this direction modern medicine has to

offer a means of controlling syphilis as important as its recent contribution to the control of syphilis by shortening its contagious period.

In 1906 Metchnikoff and Roux announced, as a result of many animal experiments, that syphilis can be prevented with reasonable certainty by the prompt inunction of a 33 per cent. calomel ointment at the point of infection.

Metchnikoff and Roux' experiments on the subject finally culminated in the experimental inoculation of a man which deserves to be recorded as an example of bravery and self-sacrifice in the interest of humanity. Objection having been made to the fact that a successful method of prophylaxis in monkeys indicated little as to its value in man, a young medical student in Paris, Paul Maisonneuve—his name deserves to be recorded, although he is only the last of a long list of physicians who have offered themselves for such sacrifice—offered himself for experimental inoculation. After Metchnikoff and Roux had become thoroughly convinced of the efficacy of the method, they accepted his offer. Maisonneuve after expert examination was found free from syphilis and, therefore, susceptible to infection with it. He was thoroughly inoculated with syphilis from two patients in the most active stage of the disease. An hour after the inoculations the sites were rubbed for five minutes with calomel ointment. At the same time a chimpanzee and four monkeys were inoculated from the same patients. The chimpanzee died of pneumonia in ten days, before syphilis had time to manifest itself. One of the monkeys was rubbed with the same ointment one hour after inoculation, as was Maisonneuve. Another of the monkeys was rubbed with the ointment twenty hours after inoculation. The two monkeys on which the calomel ointment was not used, and the monkey on which it was used twenty hours after inoculation, all developed syphilis. Maisonneuve did not develop syphilis, and the same is true of the monkey on which the ointment was used one hour after inoculation.

Soon after the introduction of this method of personal prophylaxis, its efficacy was challenged by several authorities; probably as a result of imperfect carrying out of the method. As experience accumulates, the estimate of its value increases. In the United States army in particular, in which it has been given the largest and most systematic trial, its success has been greatest and its value, when thoroughly

enforced, established beyond question. Under Major Howard, for example, at the Jefferson Barracks, only one case of syphilis developed in a series of 3,800 exposures. The previous ratio of venereal diseases was 227 per 1,000; after its introduction this ratio was reduced among those who used the prophylactic to 18 per 1,000. Schofield, Bachmann, Nichols, Maus and other surgeons in the army and navy, who have given it a thorough systematic trial in a large way, all testify in the strongest measure to the efficacy of the method.

In 1909 the constant, non-effective rate for syphilis in the United States army was 2.68 per 1,000 men. At that time the use of measures of personal hygiene to prevent syphilis were instituted, and in spite of the fact that the thoroughness with which the plan has been carried out has varied much with the personal equations of officers, and that the Wassermann test came into use in the army after this time and revealed much syphilis that would have escaped discovery, the non-effective rate for syphilis was reduced by 1913 to 1.17 per 1,000 men; that is, there has been a reduction in the non-effective rate in five years of almost 57 per cent. During the same period the non-effective rate for all venereal diseases was reduced from 11.14 to 3.58 per cent. In the opinion of the surgeon-general of the army, a still greater decrease is possible, provided commanding officers and surgeons generally can be impressed with the importance of strict enforcement of orders for preventing venereal diseases.

Surgeon Bachmann, writing on the basis of his experience in the United States navy with this method of prophylaxis, says:

> It is an almost overwhelming fact . . . that if every illicit or dangerous intercourse were followed by a reliable prophylactic, in a few years we should witness the passing of the scourge as complete as the eradication of yellow fever, bubonic plague and malaria.

It is, of course, necessary that the application be made while the spirochetes are on or near the surface at the point of infection, and in their experiments Metchnikoff and Roux determined that eighteen hours was the latest limit at which the inunctions were effective. To be most effective, the inunctions should be made within eight hours after infection; the earlier, of course, the better.

The systematic use of this method of prevention produces a prompt and very great diminution in the incidence of syphilis. Its general adoption would undoubtedly cause a great diminution in the prevalence of the disease. It is impossible to hope that any means of preventing infection simpler in application could be found. Because of the importance of the control of syphilis to the public health, this method of prophylaxis should become generally known. It surely ought to be constantly kept in mind as a method of protection for physicians, dentists, nurses, and all other persons who in their vocations are exposed to contact with syphilis.

Metchnikoff and Roux' method of personal prophylaxis is the first effective method discovered, but it is only the last of innumerable attempts at prophylaxis that go back to the very time of the introduction of syphilis. None of these have been successful; and all of them have been repudiated and most of their authors heaped with obloquy, because any method of the sort has been regarded by a part of the community as immoral and an encouragement to sexual license. If syphilis is to be regarded as a proper punishment for sexual irregularity, then all attempts to prevent its spread are unjustifiable, and the whole effort against it falls to the ground. But it is hard to believe that intelligent men and women that pretend to be humane, will, as a class, accept this attitude; and if they will not, they must desire to see the diffusion of knowledge of any means that will check the spread of the disease.

The reduction in the number of infectious lesions, and especially the great shortening of the infectious period of syphilis which can be produced by present-day methods of treatment, and the prevention of infection by Metchnikoff and Roux' method of personal prophylaxis, furnish practical measure for the sanitary control of syphilis. The first is open to no moral or social objections. The second is open to none of the objections that lie in any sort of legal recognition of prostitution, which is so obnoxious to a large school of moralists. There are, in fact, none of the usual insuperable moral obstacles to the wide adoption of these two methods of prophylaxis. From the sanitary standpoint their systematic application for the control of syphilis is as rational and as practical, as the systematic attack on the mosquito is for the control of yellow fever. When their adoption

becomes general, medicine can claim, I believe, to have furnished means for the control in great part of the ravages of this hideous scourge of modern man.

This consideration of prophylaxis of syphilis has been confined to the measures which medicine has to offer in the sanitary prophylaxis of the disease. The medical profession is, I venture to believe, more keenly interested in the social aspects of the problem than any other group in the community, for the reason that it has a more intimate knowledge of the perils and misery of syphilis. But the social problems involved in the control of syphilis are not problems on which medicine can pretend to speak with the greatest authority. These problems belong to sociology. I dare to urge, however, that if syphilis is ever to be controlled it will be by attacking it as a sanitary problem.

I am far from any desire to minimize the importance of the efforts to control syphilis and the other venereal diseases by methods of social and moral prophylaxis. It would seem to be the bounden duty of right-minded parents to have their children properly informed about the obvious facts of sexual life and about the dangers of the venereal diseases. How important it is that the knowledge of the dangers of the venereal diseases should be gained in youth, is shown by the fact that of all times of life the age between 18 and 24 years represents the period at which syphilis is most frequently contracted by both sexes. There can be no doubt of the usefulness of the efforts to educate the adult public also with regard to the formidable dangers of syphilis and gonorrhea. It surely makes for the reduction of venereal diseases to inculcate the importance of high standards of morality and the hygienic value, to say nothing of other things, of clean living. It is the duty of society to protect its youth and its young manhood and womanhood, as far as possible, from the temptations that arise from improper suggestions and surroundings and associates.

Last and most important of all, society should awaken to the danger that arises from the later and later postponement of marriage, and should make some effort to modify the conditions of life which render it economically impossible for most young men and many young women to marry. It should recognize that the tendency to postpone

marriage until well along in adult life is a direct play in favor of the venereal diseases.

But all of these factors have to do only with the predisposing causes of syphilis. The actual cause of the prevalence of syphilis is the sexual appetite. The sexual appetite is a natural phenomenon; after hunger, it is the dominant influence of man in the whole conduct of his social relations. And from the biologic standpoint, no plan for the reduction or suppression of venereal diseases can appeal as practical which does not accept the fact that the sexual appetite, except within narrow limits, is beyond society's control. If syphilis is to be controlled, its control must come by treating it as a sanitary problem. Medicine can offer now practical measures which are effective for such control. This is the contribution which syphilology has to offer to the solution of the immensely important public problem of the checking of the venereal peril.

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